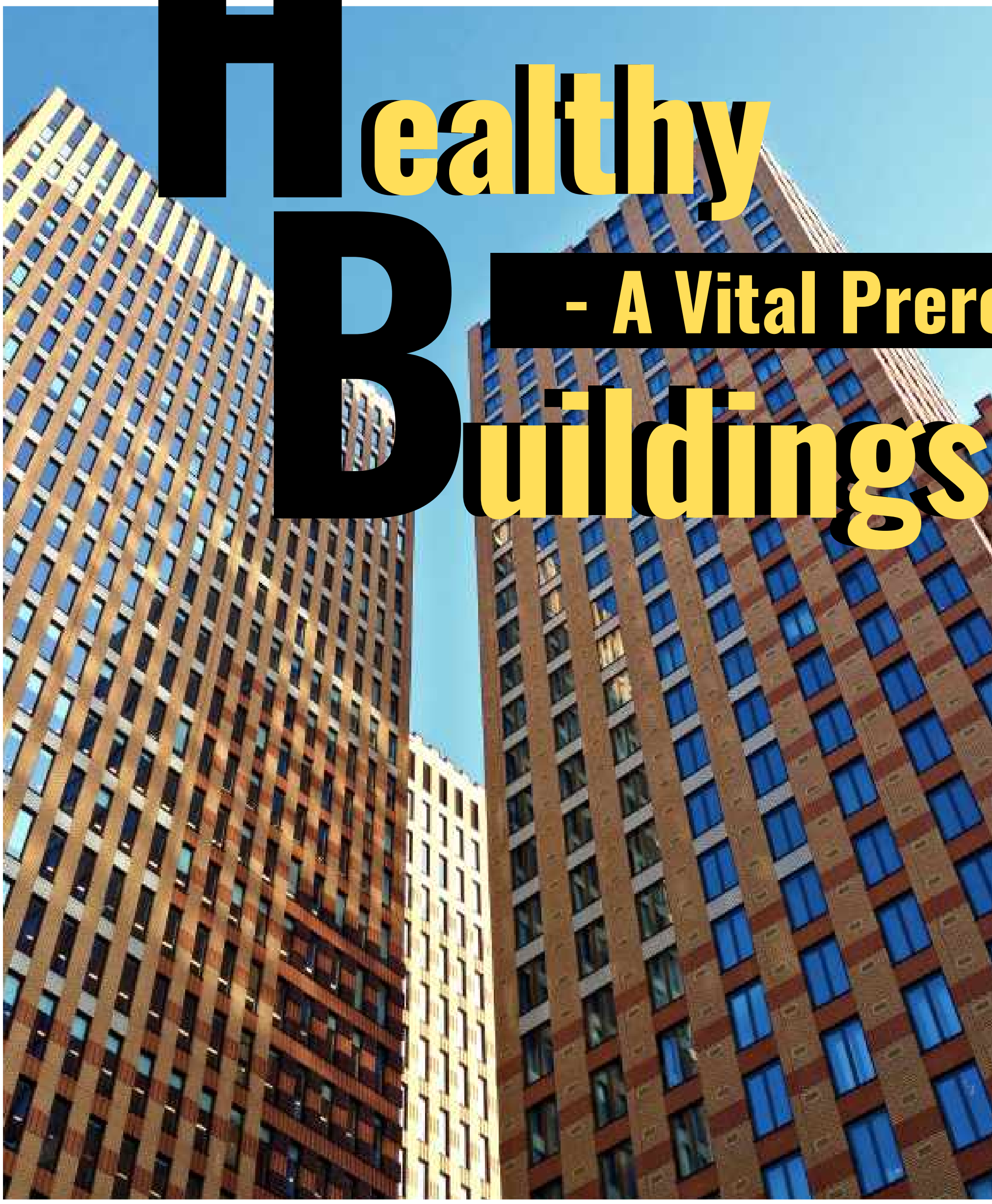
Vol. I, Issue 4, April - June 2020

The Indoors

Quarterly Newsletter of Society for Indoor Environment (SIE)

SIE

Healthy Buildings - A Vital Prerequisite



EXCLUSIVE

SIE Webinar Series Reportage

Vol. I, Issue 4, April - June 2020

HEALTHY BUILDING:
A VITAL PREREQUISITE

The present era of Covid 19 pandemic has forced the population to stay indoors for containment of the highly contagious virus SARS- CoV-2.The importance of indoor environment is profusely increased as a result of this pandemic.The physical health of these buildings occupied for various purposes like residential, office spaces,social interactions becomes an area of prime investigation.Healthy buildings determine the manner in which the indoor spaces drive the performance and productivity of its occupants.

PRESIDENT'S NOTE

Dr. Arun Kumar Sharma

Our living spaces are our cherished spaces. Most of us have dreams of creating our living spaces and toil hard to create it. The focus mostly has been on the design, aesthetics and synchrony with our dream homes. All this is fine, but to that we need to add a few more dimensions that ensure that dream homes are not only a place for peace of mind but also a place for our physical existence in the healthiest possible manner. And that depends more on certain physical parameters then on our perceived concepts of good homes. In this issue, Dr. Anubha Goel has emphasized the importance of ventilation, one of the more important parameters of healthy living. There is need to create awareness about significance of proper ventilation, within available means in low socioeconomic groups where ventilation may be a luxury and in high socioeconomic groups too because there the artificial ventilation is given priority over natural ventilation. The second important aspect is living in green environment, it becomes more significant as natural forests are being sacrificed to make space for human habitation, as a result the shrinking green cover of the planet needs to be compensated by at least islands of greenery in neighbourhoods and micro-greening inside our homes.

Like living beings, the buildings also become sick and we can ignore that only at our own risk. And then there is the invisible enemy, the harmful microbes that insidiously find their abodes in poorly ventilated, poorly maintained housings and lack of adequate cleanliness. Dr.Wesam has highlighted that appropriately in this issue. They are the frontline enemies that invade our bodies to do all harm, most of the infectious diseases including the current pandemic of COVID-19 owes it's success to poor ventilation and overcrowding. It is time to take note of these parameters while creating and maintaining the most important physical spaces in our lives to make life healthier, happier and more productive.

Vol. I, Issue 4, April - June 2020

Content

Vol. I, Issue 4, April - June 2020

Article

WHAT'S INSIDE

VENTILATION

Ventilation is Essential to Maintain Acceptable IAQ and to Ensure the Health and Comfort of Occupants in Enclosed Spaces

Dr. Anubha Goel,
Associate Professor,IIT Kanpur

Good health is vital towards an active and productive lifestyle and calls attention towards construction of healthy built environments for occupants where a high indoor environment quality (IEQ) is maintained.

Some sources, such as building materials, furnishings, and household products like air fresheners, release pollutants more or less continuously in an indoor environment. Other sources related to activities carried out in the home, like dusting and use of solvents during house cleaning, smoking, the use of unvented or malfunctioning stoves, or space heaters, etc. release pollutants intermittently. Pollutants from some of these activities can have a high residence time. Airborne particles, Volatile Organic Compounds (VOCs) mainly formaldehyde, are the indoor pollutants most frequently considered. According to the United States Environmental Protection Agency (USEPA), human exposure to indoor air pollutants maybe 2 to 5 times—occasionally more than 100 times higher than outdoor pollutant levels. Indoor air pollutants rank among the top five environmental risks to public health. If too little outdoor air enters a home, pollutants can accumulate to levels that can pose health and comfort problems.

Green building certifications aim to achieve sustainable buildings that are healthy, energy-saving, and environmentally friendly.Research underway worldwide clearly indicates better indoor environmental quality (IEQ) in green buildings versus non-green buildings, with direct benefits to human health for building occupants. Indoor Air Quality (IAQ) is a significant contributor to IEQ (includes quality of air, thermal, visual, acoustic, odor, lighting, and vibrations). Emission source control, ventilation, and indoor air measurement are the three main pathways used in green building schemes for IAQ management.

VENTILATION

1

The word ventilation comes from the English noun 'vent' which means 'a small opening that allows air, smoke, or gas to enter or leave a closed space"

- Source : Cambridge dictionary

It accomplishes two separate functions:

a) To provide air for breathing and to provide fresh air to maintain IAQ (in all weather conditions), and
b) To provide air movement for thermal comfort (In warm weather).

Inadequate ventilation can increase indoor pollutant levels by not bringing in enough outdoor air to dilute emissions from indoor sources and by not carrying indoor air pollutants out of the home. High temperature and humidity levels can also increase concentrations of some contaminants.

Green building certifications aim to achieve sustainable buildings that are healthy, energy-saving, and environmentally friendly. Research underway worldwide clearly indicates better indoor environmental quality (IEQ) in green buildings versus non-green buildings, with direct benefits to human health for building occupants. Indoor Air Quality (IAQ) is a significant contributor to IEQ (includes quality of air, thermal, visual, acoustic, odor, lighting, and vibrations). Emission source control, ventilation, and indoor air measurement are the three main pathways used in green building schemes for IAQ management.

Green building certifications aim to achieve sustainable buildings that are healthy, energy-saving, and environmentally friendly. Research underway worldwide clearly indicates better indoor environmental quality (IEQ) in green buildings versus non-green buildings, with direct benefits to human health for building occupants. Indoor Air Quality (IAQ) is a significant contributor to IEQ (includes quality of air, thermal, visual, acoustic, odor, lighting, and vibrations). Emission source control, ventilation, and indoor air measurement are the three main pathways used in green building schemes for IAQ management.

Table 1. Recommended values of air changes in a building
(*Source: Bureau of Indian Standards BIS*)

Type of indoor microenvironment	BIS-1996 (ACPH)
Building and rooms	3
Bedroom	3
Kitchen	6
Bathroom	6

Ventilation has a significant impact on several important human outcomes attributed to poor indoor air quality. These include:

(1) communicable respiratory illnesses;

(2) respiratory

allergies and asthma among occupants;

(3) Sick Building Syndrome Symptoms

(4) task performance and productivity and

(5) perceived air quality (PAQ)

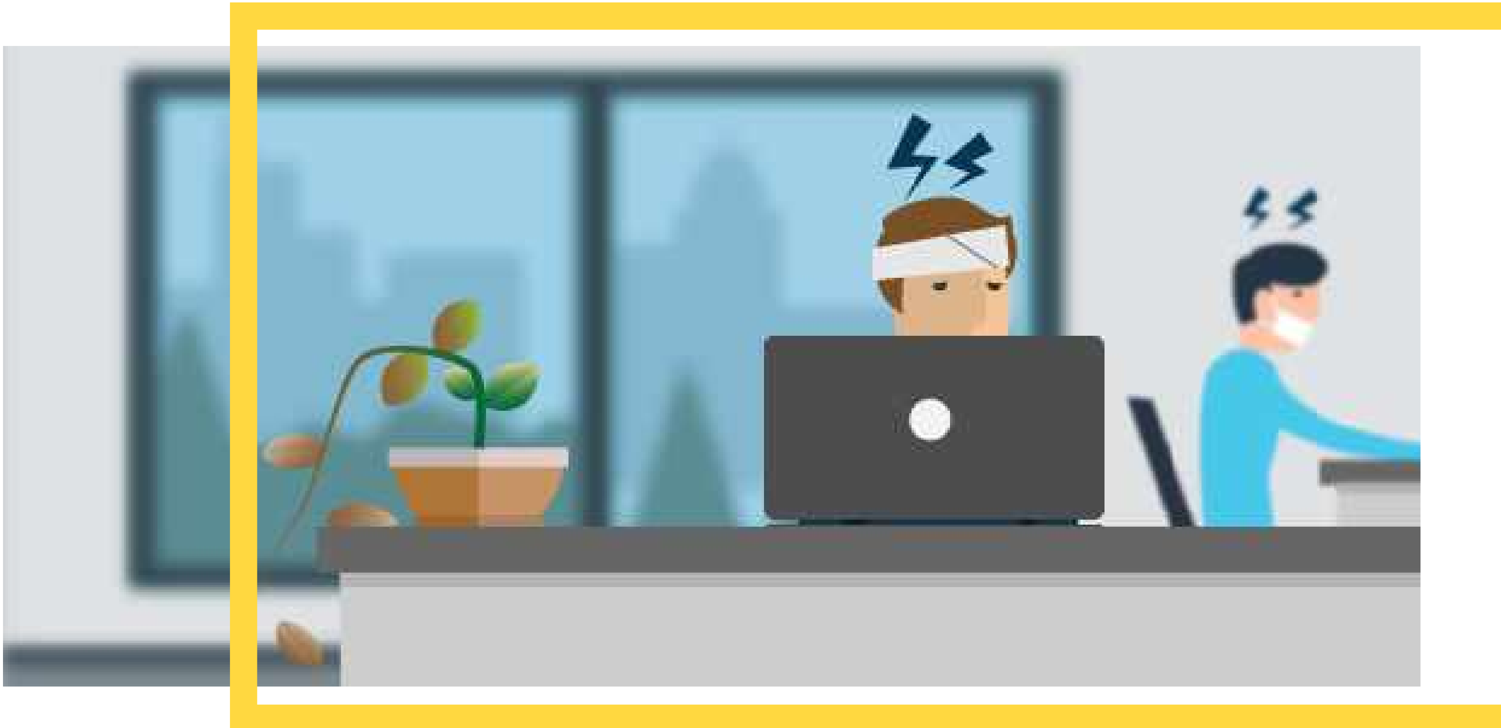
SICK BUILDING SYNDROME(SBS)

Sick building syndrome (SBS), an increasingly significant occupational hazard, is attributable to the accumulated effects of a multitude of factors, such as the indoor environmental quality, building characteristics, building dampness, and activities of occupants. The syndrome comprises of various nonspecific symptoms that occur in the occupants of a building. This feeling of ill health increases sickness absenteeism and causes a decrease in the productivity of the workers. The leading cause of SBS among the offices in urban centers is inadequate ventilation, recycling of air in rooms using fan coils, traffic noise. Light-intensity, another IEQ parameter, is significantly associated with some symptoms such as skin dryness, eye pain, and malaise. Nowadays, people are excessively dependent on air conditioning to create a comfortable indoor environment, but it could cause some health problems in the long run. Often the prevalence of SBS symptoms is higher in air-conditioned buildings than in naturally ventilated buildings.

Health benefits associated with enhanced ventilation rates reportedly far exceed the per-person energy costs relative to salary costs

In case of ventilation at rates well above the minimum levels prescribed in existing standards and guidelines, results show a notable improvement in Perceived Air Quality, which results in benefits for health, comfort, and productivity. Cognitive function scores are significantly better under Green building conditions than in the Conventional building conditions. Reduced absenteeism and improved health follow enhanced ventilation.

2



Several studies have examined the relationship between classroom ventilation rates and academic achievement. A linear association between the two is observed in most cases. Studies from India report that classroom ventilation is inadequate with ventilation rates below guideline values, possibly leading to health symptoms. Increasing the ventilation rate in classrooms has been shown to bring significant benefits in terms of learning performance and pupil attendance.

Role of ventilation in airborne transmission of infectious agents in the built environment is recognized.

There is sufficient and robust evidence to demonstrate the association between ventilation, air movements in buildings, and the transmission/spread of infectious diseases such as measles, tuberculosis, chickenpox, influenza, smallpox, and SARS. Recognition of airborne transmission of coronavirus as the leading cause of community spread the pandemic raises concern about the status of ventilation conditions indoors (Box 3).

3

COVID-19 Raises the Stakes for Healthy Buildings

- There is substantially more awareness and interest on the part of the public, in terms of the quality of the spaces that they're occupying.
- Changing work, as underscored by the wide-scale shift to telecommuting during the coronavirus crisis

HEALTHY BUILDING MOVEMENT

Healthy building refers to an emerging area of interest that supports the physical, psychological, and social health and well-being of people in buildings and the built environment. The realization that health benefits far outweigh monetary costs involved (Box 2) is leading towards a 'healthy building movement.' Listed below are some factors that have globally promoted this movement.

- Changing populations due to the large migration to cities;
- Changing cities due to increased densification;
- Changing resources, with urbanization making resources scarcer.

Much of the healthy building movement aligns with environmental sustainability objectives. It complements the achievement of Sustainability Development Goals (SDGs) outlined by the United Nations, to which India is also a signatory.

4

Practical strategies for IAQ management

For air quality, there are local areas without ventilation and toxic gases not discharged in time. Therefore it is necessary to take adequate measures to improve air quality. Ventilation improvement is hence not enough. Other strategies, such as pollutant source control and the use of particle filtration, should also be considered More research on what works best is needed. A true demand-based ventilation system with an economy air cycle not only offers reduced amounts of energy consumption but also can take part in a healthy indoor environment.

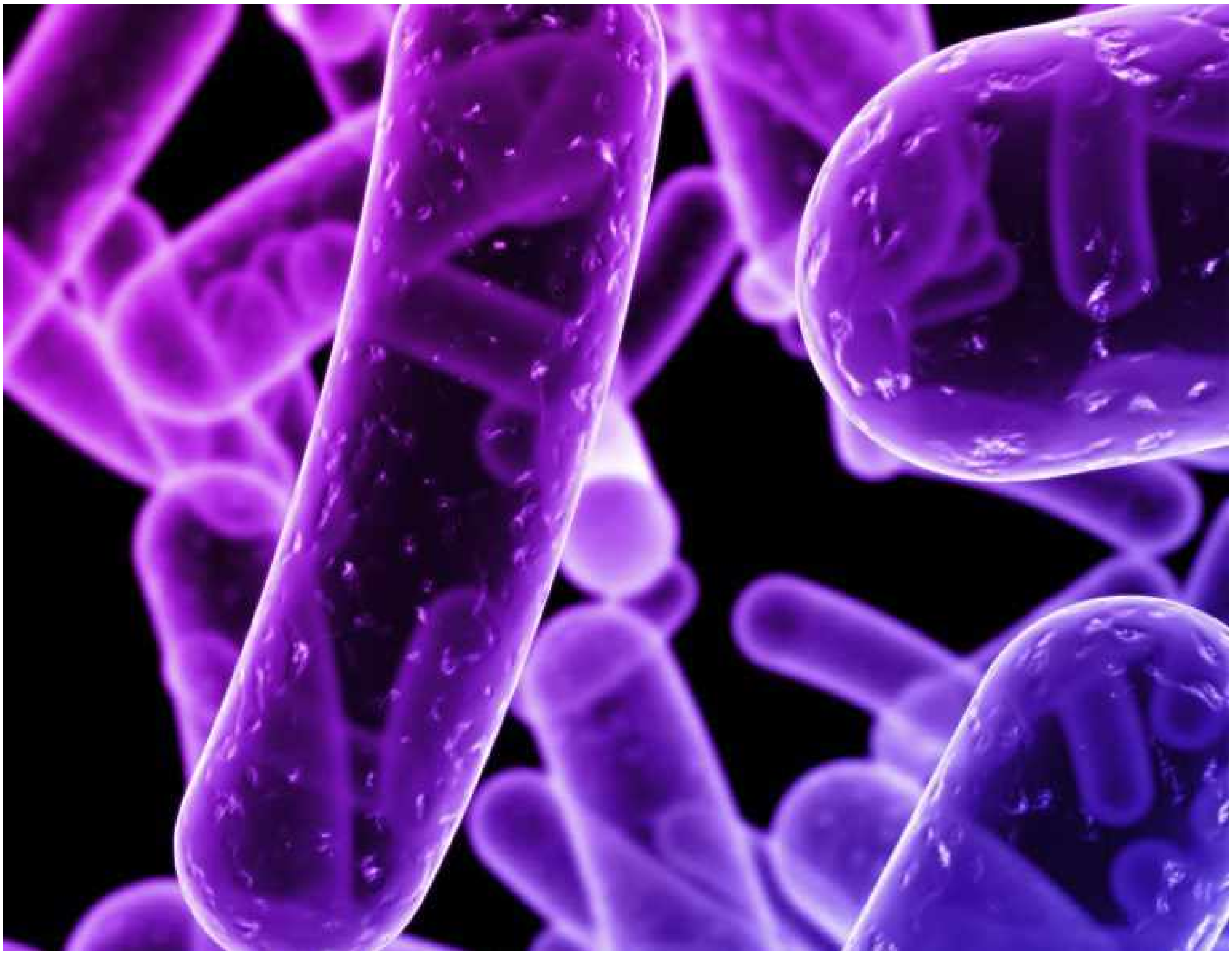
Buildings can be key promoters of health and well-being. Ventilation is a critical component of green homes, and it plays a vital role in the assessment of human exposure to air pollutants in the indoor environment

Inadequate ventilation, combined with high temperature and humidity levels, which can hold a greater concentration of gases, is found to result in indoor air with a higher concentration of gases and particles compared to outdoor air. Globally, 4.3 million deaths were attributed to exposure to indoor air pollution in developing countries in 2012, almost all in low and middle-income countries. Accumulation of pollutants indoors can lead to unhealthy conditions. It implies that adequate ventilation should be a significant focus on design or remediation efforts. In combination with alternate air purification strategies, this is a useful tool that can ensure a healthy and sustainable indoor environment.

Vol. I, Issue 4, April - June 2020

Research Paper

MICROBIAL POLLUTION



Assessment of Indoor Microbial Environment of Labs & Faculty Offices at a University in Gaza, Palestine

1) Dr.Wesam A. Al Madhounla, Universiti Tun Hussein Onn Malaysia,Johor, Malaysia
2) Eman Y. Abed & Abdelraouf A. Elmanama, Islamic University of Gaza, Gaza, Palestine
3) Hyunook Kim,University of Seoul, Seoul, Republic of Korea
4) Xiaohong Xu,University of Windsor, Windsor, Canada

ABSTRACT

Bacteria and fungi grow indoors when sufficient moisture is available, causing indoor air pollution. The aims of this study were to determine the total viable bacterial count and fungi levels at the labs and faculty offices of the Islamic University of Gaza (IUG). Twenty six air samples were collected from the IUG labs and faculty offices using air samplers. The results show that the highest bacterial count was observed at the Medical Science Labs with 1365 colony-forming unit (CFU)/m3 while the highest fungal count was detected at the Environment Science Labs with 425 CFU /m3. The majority of the monitored labs and offices have higher bacterial and fungal levels than the WHO standards of 500 CFU/m3. Lab users should wear face masks to reduce any potential health impacts due to the microbial pollution.

INTRODUCTION

Indoor air quality is an important environmental element that influence our health. Human beings breathe 10 m3 air every day, and they spend 80–95% of their live indoors. The indoor air pollution can result in health problems and even may increase human mortality [1]. The indoor environment contains a complex mixture of live and dead micro-organisms, fragments, toxins, allergens, volatile organic compounds, etc. [2].

As people spend most of their time in closed environments, concern on air contaminants in such places is justifiable. Bacteria, fungi and virus, may form biological air contaminants, and their distribution may vary depending on the environment, even on areas within the environment. Heating, ventilation and air conditioning systems may also be microbial sources [3].

There are more evidences that exposure to biological agents in the indoor environment can have adverse health effects. Recently, a report on indoor air quality, especially on dampness and mold, by the WHO provided sufficient epidemiological evidences that inhabitants of damp or moldy buildings, both homes and public buildings, are at an increased risk of respiratory symptoms, respiratory infections and exacerbations of asthma [4].

A variety of factors can affect the indoor air quality of a building including the physical layout of the building, the building's heating, ventilation and air condition. In addition, the outdoor climate, the people working in these buildings and contaminants inside and outdoor the buildings also should be considered as influential factors [5].

Microbial pollution involves hundreds of species of virus, bacteria, and fungi that grow indoor when sufficient moisture is available. The presence of many biological agents in the indoor environment is due to dampness and inadequate ventilation.. Excess moisture may result in increased chemical emissions from building materials and floor covers [2], which influence fungal and bacterial numbers indoor. In the hot and humid summer, the number is high, while it is low in cold and dry winter [4].

Several health issues have been associated with fungal and bacterial species in the indoor environment. They include rhinitis, upper respiratory symptoms, asthma and other effects such as allergic skin reactions, tiredness and headaches. Temperature and relative humidity appear to be major factors influencing the levels of fungi and bacteria in the indoor environment. Mold formation and dampness can be reduced if a sufficient ventilation is supplied, so any potential health risk caused by fungi and bacteria indoors can be reduced [6].

In this research, fungi and bacteria in labs and faculty offices in the Islamic University of Gaza (IUG), Gaza City, Palestine, were sampled and analysed.

MATERIAL AND METHODS

STUDY AREA

A cross-sectional prospective study was conducted to assess bacteria and fungi in research labs and faculty offices of a university in Gaza City, Palestine, which is with more than 20,000 students and 1400 staffs.

A total of 26 samples were collected from different labs and offices in the university (Table 1); 8 samples were collected from the environment department, 6 from biology, and 5 from chemistry department. Sampling was carried out over a month (April_ May 2013)

Table 1. Sampling Points and Number of Samples

Locations	# of Samples	
	Labs	Offices
Biology	5	1
Chemistry	4	1
Environment	7	1
Physics	3	0
Medical	3	1
Sub-total	22	4
Total	26	

MATERIAL

Culture media used for counting bacteria and fungi
were as follows:
A -Dichloran Rose Bengal Chloramphenicol (DRBC) agar (Oxoide-UK)
DRBC agar is used for the enumeration of yeasts and molds; colonies of molds and yeasts should be apparent within 5 days of incubation. Colonies of yeast appear pink due to Rose Bengal.

B -Nutrient agar (NA; HiMedia- India) for bacterial counting

SAMPLING & MEASUREMENT

The following devices were used; air sampler, autoclave, incubator, colonies counter and auto ranging multimeter. Samples which were collected from the labs and offices of IUG for over a period of one month as follows:

An air sampler (Sampl'air-AES CHEMUNEX, France), as shown in Fig. 1a, was used to collect air samples. Petri dish was put on the top of the device and a pre-determined volume of air (100 L) was collected.

NA was used to collect samples for bacterial count, which was later transferred to the laboratory in an icebox, and incubated for 24 h at 37 oC before the grown colonies were counted [7].

Fig.1. (a) Nutrient Agar plate and (b) Air sampler

Dichloran Rose Bengal Chloramphenicol agar as shown in Fig. 2 was used as the culture medium for fungi. It was also transferred to the laboratory in an icebox and incubated for 5 d at 25 oC before grown colonies were counted [8].

(a) DRBC Agar **(b) Colonies Counter**

Fig 2. (a) Dichloran Rose bengal Agar plate and (b) colony counter

Humidity and temperature of each laboratory were measured simultaneously using Auto Ranging Multimeter (Digital Multimeter MASTECH MS8209, China).

RESULTS AND DISCUSSION

BACTERIA

The mean bacterial count of 26 samples collected from the university labs and offices was 1048 CFU m-3. As shown in Table 2. The highest mean bacterial count was at the labs of Medical Science Dept. (1365 CFU m-3) and the lowest was at Biology labs (780 CFU m-3). The high levels of bacterial count could be due to the crowdedness of Medical labs and in these laboratories; microbes and parasites are being analysed for clinical purposes.

Table 2. Total Bacterial and Fungal counts

Locations	N	Mean CFU m-3	Std. Dev	Min CFU m-3	Max CFUm-3
Bacterial Count					
Environment Science	8	947.5	750.5	190	2320
Biology	6	780	315.4	530	1300
Chemistry	5	1122	511.6	570	1780
Medical Sciences	4	1365	933.4	340	2280
Physics	3	1306.6	502.9	940	1880
Total	26	1048	624.4	190	2320
Fungal Count					
Environment Science	8	425	410.1	100	1120
Biology	6	283.3	126.4	70	390
Chemistry	5	378	206.4	170	680
Medical Sciences	4	245	205.5	60	520
Physics	3	356.6	180.1	180	540
Total	26	347.6	263.7	60	1120

The results in Table 3 shows a high rate of failure to comply with WHO standard as shown in Table 3. This depends on the level of hygiene, aeration, sunlight, the use of disinfectants and antiseptics, number of students, labs design, and soon.

Humidity and temperature of each laboratory were measured simultaneously using Auto Ranging Multimeter (Digital Multimeter MASTECH MS8209, China).

Table 3. Comparing Bacterial and Fungal counts to WHO Standards

Location	N	< 500 CFU/m³		> 500 CFU/m³	
		N	%	N	%
Bacterial Count					
Environment Science	8	4	50%	4	50%
Biology	6	0	0	6	100
Chemistry	5	0	0	5	100
Medical Sciences	4	1	25	3	75
Physics	3	0	0	3	100
Total	8	4	50%	4	50%
Fungal Count					
Environment Science	8	6	75%	2	25%
Biology	6	6	100%	0	0%
Chemistry	5	4	80%	1	20%
Medical Sciences	4	3	75%	1	25%
Physics	3	2	66%	1	34%

Table 3 also shows the bacterial counts and percentage of air samples that were compared to WHO standards.. The WHO standard states that bacteria of > 500 CFUm-3 is considered to be polluted. In this study; 81% (n= 21) of the air samples were considered polluted and 19% (n=5) were considered unpolluted. A similar result was reported at a study in Turkey [9]. As shown in Table 2, the maximum levels of bacterial count range from 1300 to 2320 CFU m-3 which is in line with the literature [10].

The analysis results of all (100%) the samples that were collected from Biology, Chemistry, and Physics labs failed to meet the WHO standards of 500 CFUm-3.This could be due to high humidity, poor ventilation, and tens of working people.

The lowest failure percentage was found at the Environment labs (50%). This may be attributed to the nature of these laboratories.

Figure 3 shows the mean of bacterial counts at laboratories (1088 CFU m-3) and faculty offices (825 CFUm-3). This was expected because the level of cleanness at the faculty office is higher than labs.

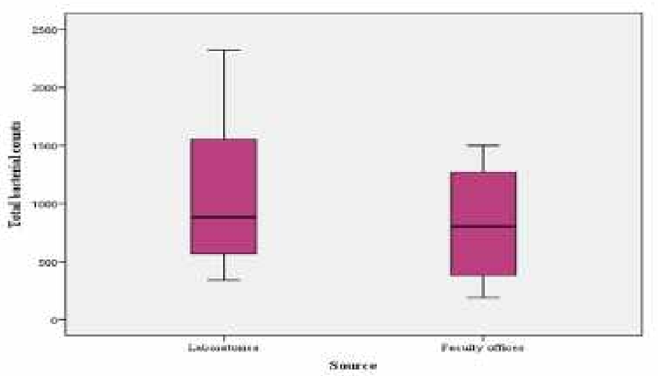


Fig.3. Total bacterial count in air samples at labs and faculty offices

Figure 4 shows that 81.8% of the samples which were collcetd from labs and 25% of the samples collected from faculty offices were found having high bacterial concentration of more than 500 CFUm-3.. This may be due to the higher number of occupants (students and staff) and the occupancy rate at labs.

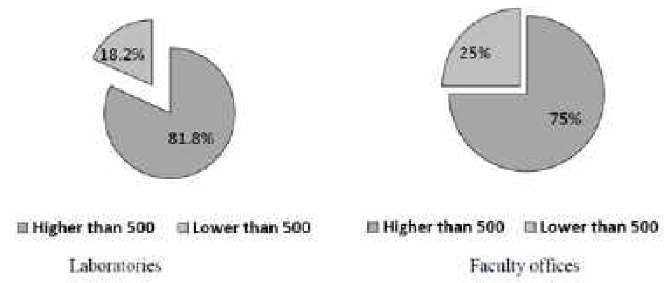


Fig.4. Bacterial counts in air samples in Labs and faculty offices

FUNGI

The fungal counts of 26 samples had a mean of 347.6 CFU/m3 as shown in Table 2, the highest mean of fungal count (425 CFU/m3) was at Environment and Earth Science Department labs and the lowest was at Medical Science Labs Departments (25 CFU/m3).

Following the WHO standard which states that fungal counts of more than 500 CFU/m3 is considered to be polluted, 19.2% (n= 21) of the IUG air samples are considered polluted and 80.8% (n=5) are considered unpolluted.Table 3 shows the number and percentage of air samples having fungal count below and above the WHO standards distributed by department, the highest percentage was at Physics Department with 34% and the lowest was at biology department with 0%. These difference were not statistically significant (p =.650).

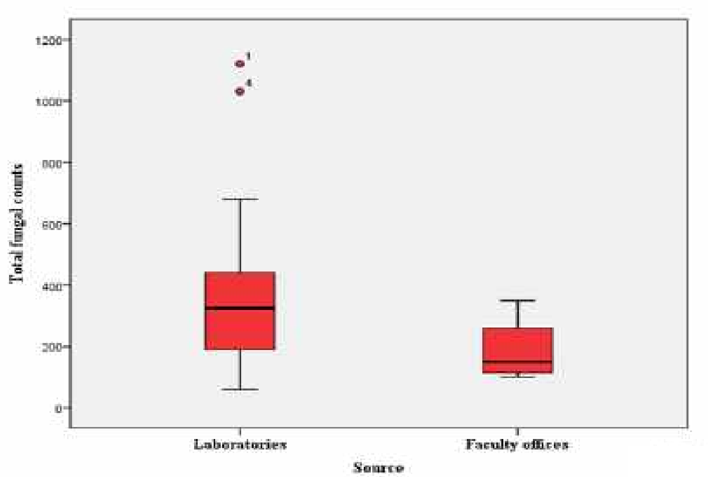


Fig. 5. Total fungal count at labs and faculty offices

The results in Figure (5), shows that the mean of total fungal counts at at the IUG labs was 376 CFU/m3 which is higher than the total counts at the faculty offices (187 CFU/m3)

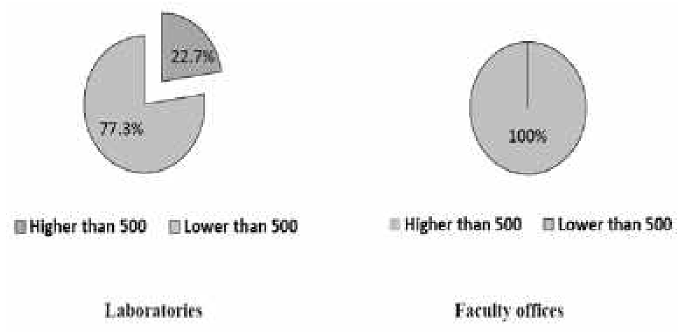


Fig. 6. Fungal counts in air samples in Labs and faculty offices

Figure (6) shows that 22.7% of the labs samples found to have high total fungal count of concentration great than 500 CFUm-3 and this may be due the high humidity and low ventilation at the IUG labs..

Regarding the temperature and humidity records, the monitoring results show that the mean temperature at IUG labs was 23.1°C which meets standards of the American Society of Heating, Refrigerating and Air-Conditioning Engineers “ASHRAE” (20-25 °C), while the mean humidity was 65.1% and this exceeded the ASHRAE standards of 40-60%.

CONCLUSION

The air samples that were collected from IUG labs and faculty offices found containing high bacterial and fungal counts with a mean concentration of 1048 CFU m-3 and 348 CFU m-3 respectively. Furthermore, it was found that 81% of the bacterial counts and 19% of the fungal counts were higher than the WHO standards of 500 CFU m-3.

The highest mean bacterial counts were found at the Medical Laboratories Sciences Departments (1365 CFU/m3) and the lowest was at Biology Departments (780 CFU/m3).

[1] J. Cabral, Can we use indoor fungi as bio-indicators of indoor air quality? Historical perspectives and open questions, Sci. Total Environ. 408, 4285 – 4295 (2010).

[2] World Health Organization, “WHO Guidelines For Indoor Air Quality –Dampness and Mould,” (2007). http://www.euro.who.int/__data/assets/pdf_file/0009/78678/E91146.pdf

[3] A. Grigorevski R. Lima, L. Silva, R. Linares, and R.Coelho, Occurrence of actinomycetes in indoor air in Rio de Janeiro, Brazil, Build and Environ. 41, 540–1543 (2006).

[4] S. McMahon, J. Hope, J. Thrasher, W. Rea, A. Vinitsky, and M. Gray, Common Toxins in Our Homes, Schools and Workplaces, Global Indoor Health Network (2012). www.guidestar.org/ViewEdoc.aspx?eDocId=2196593&approved=True

[5] Centers for Disease Control and Prevention (CDC), Factors Affecting Indoor Air Quality, (2017). https://www.cdc.gov/niosh/pdfs/sec_2.pdf

[6] D. M. Kuhn, M. A. Ghannoum, Indoor Mold, Toxigenic Fungi, and Stachybotrys chartarum: Infectious Disease Perspective, Clin Microbiol Rev. 16 (1), 144–172 (2003).

[7] D. Méheust, J. P. Gangneux, P. L. Cann, Comparative evaluation of three impactor samplers for measuring airborne bacteria and fungi concentrations, J Occup Environ Hyg. 10 (8), 455-9 (2013).

[8] S. Mentese, M. T. Otkun, E. Palaz, Comparison of dichloran rose bengal chloramphenicol and Sabouraud dextrose agar with cycloheximide and chloramphenicol for airborne mold sampling, Aerobiologia.doi:10.1007/s10453-016-9462-2 (2016).

[9] S. Mentes¸e, M. Arisoy, A. Y. Raed, G. Gullu, Bacteria and Fungi Levels in Various Indoor and Outdoor Environments in Ankara, Turkey, Clean, 37 (6), 487 – 493 (2009).

[10] E. Karwowska, Microbiological Air Contamination in Some Educational Settings, Pol. J. Environ. Stud.,12 (2), 181-185 (2013).

EXCLUSIVE

Reportage

Dr. Sumanth Chinthala

WEBINAR SERIES

With these unprecedented pandemic times bringing the life, at large, to a standstill, there were healthcare professionals, researchers and scientists working out at ground to minimize its impact on general population. SIE, too, worked towards bridging the knowledge gap between science and mankind and contributed by bringing the experts from technology, research and public health to a common forum to understand the dynamics and management of Covid-19. Keeping its mission at fore, SIE organized a Webinar Series “Environment and Covid-19” in June 2020 with professionals from India and abroad being a part to it. The Webinar series received an overwhelming response from 27 states across India and the globe. The experts provided their insight and research inputs on subjects ranging from Opportunities and Challenges during and after Covid-19, air quality in cities and built environment during the pandemic and mitigating the issue by ventilation and need for healthy buildings in near future.

Fig.1 Participation in the SIE Webinar series from India and more

SPEAKERS

DR. RAKESH KUMAR

PROF. ARUN KUMAR SHARMA

Fig 2. Webinar in progress with Dr. Rakesh Kumar, Director, CSIR- NEERI and Prof. Arun Kumar Sharma,President, SIE on 6th June

AIR IN PANDEMIC TIMES

DR. PRASAD MODAK

PROF. PAOLO CARRER

Fig 3. Webinar on "Air in pandemic times" wih Dr. Prasad Modak, Executive President, EMC and Prof. Paolo Carrer, Director, Oespedale Luigi Sacco ,Italy

AIR QUALITY IN URBAN BUILT ENVIRONMENT

SPEAKERS

DR. ANUBHA GOEL

PROF. PRASHANT KUMAR

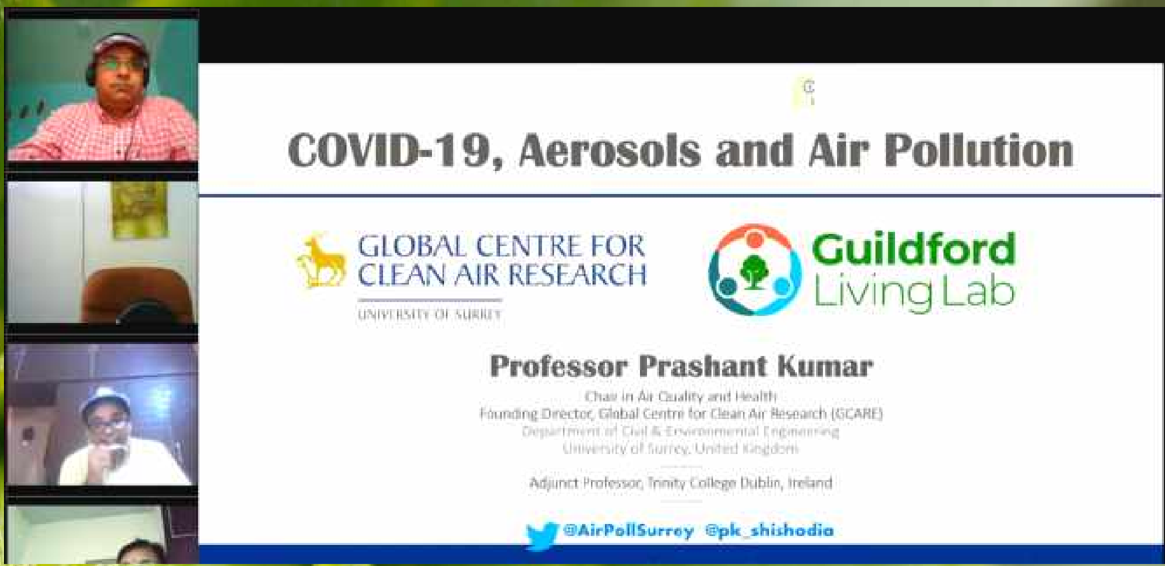


Fig.4 Webinar on "Air Quality in Urban built Environment" with Prof. Prashant Kumar, Professor and Chair, University of Surrey, U.K. and Dr. Anubha Goel, Associate Professor, IIT Kanpur.

OUTDOOR AIR VS. INDOOR AIR IN COVID-19

SPEAKERS

DR. AJAY TANEJA

DR. RAVINDRA KHAIWAL

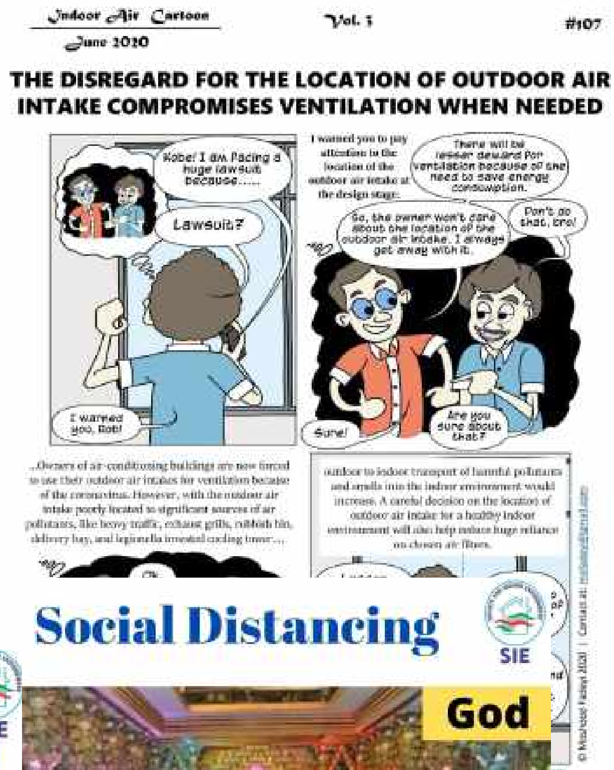
Fig.5 Webinar on "Indoor air Vs Outdoor air in Covid 19" with Prof. Ravindra Khaiwal, PGIMER, Chandigarh and Prof. Ajay Taneja, Dr. B.R. Ambedkar, Agra

These sessions were aimed to sensitize the larger population about how we should mould ourselves and improve our knowledge on basic air quality and indoor air quality in particular. The sessions gave various insights on how the pollutant transport has affected people and how it is going to affect the receptors in future. Additionally, the reduction in the average life expectancy due to air pollution is already a challenge for all of us. These sessions also enabled us to understand the various types of measures that are needed to curb the emissions when things are restored to normal. These sessions have also helped the common public to understand the relative contribution of each sources which are causing trouble to the residents in urban and rural environments in both outdoor and indoors. Hence, for the sake of larger good and for the upliftment of the human race as a whole, understanding more and more about air pollution is crucial for the survival of humans in the coming decades.

Events & Happenings

WEBINAR SERIES

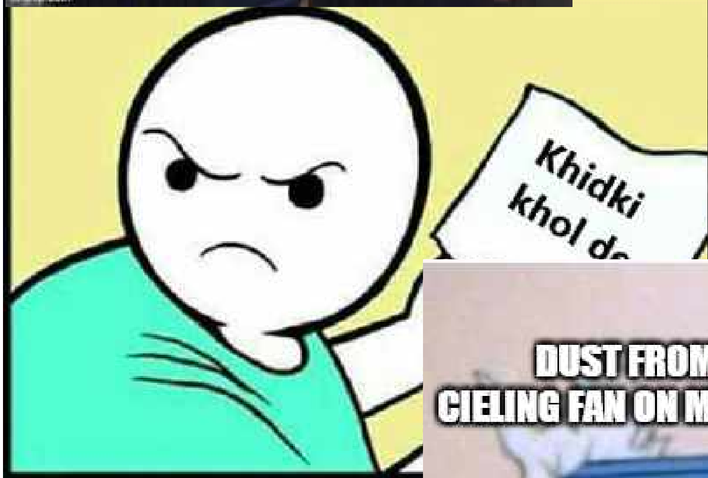
Social Media

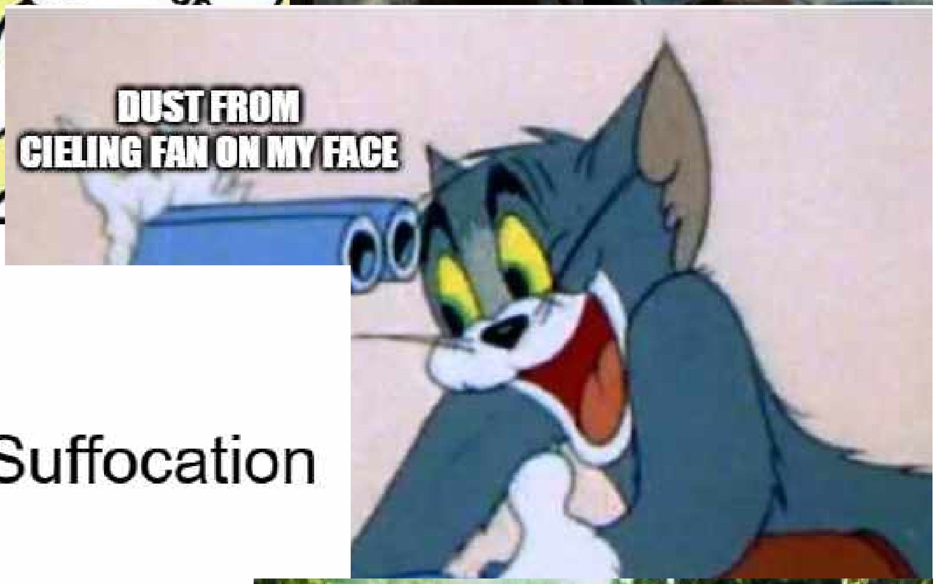


INFORMATIVE POSTER

Vol. I, Issue 4, April - June 2020

MEMES





MEMES


WHO: "GOOD INDOOR AIR QUALITY SAVES MONEY"
In the publication "School Environment: Policies Current Status", the World Health Organizati
shares information about many aspects of indoor climate, and carbon dioxide (CO_2) is one of
the focus areas. The report is based on a questionnaire involving 31 countries spread across
western Europe and western Asia.
MOHABBAT THI ISLIYE JAANE DIYA I ZID HOTA......
POLLUTION KO KAM KARNE KA ZID NAHI H TERE PAAS ?
paisa h
Indoor Air Pollution
AAP DONO SATH ME BAITHE HO?
Outdoor Air
Mosquitoes in balcony
No fresh air in indoors
how to create awareness on Indoor Air Quality
webinars
Newsletters
Make a tiktok video !
Corona virus spreads from
human
Panik
Kalm
Panik

EDITORIAL COMMITTEE

DISCLAIMER

The research findings and opinions presented in the SIE newsletter are solely the author's prerogative. SIE doesn't endorse any product or research finding.