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# Aeromicrobiology – A Critical Study on Surrounding Air

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**Abstract –** Aero-microbiology is the study of the organisms and particles of biological origin – known together as bioaerosols – that float around in our planet's atmosphere. Aero-microbiology is the area of biological sciences that describes the activities of aerial microorganisms. Basically, troposphere is the closest aerial zone of earth that exhibit the overload of microorganisms. After suspending in the air, the microorganisms can travel throughout a long distance and can create several diseases not only in human beings but also in other living organisms also. This review article covers the effect of bioaerosols on producing diseases in living organisms.

***Key Words*:** Microorganisms, Endospore, bioaerosols, troposphere.

## 1.INTRODUCTION

Aero-microbiology is that zone of biological science which describes the study of air living microorganisms. These aerial microorganisms are called bioaerosols [1]. These bioaerosols have tremendous capacity to create diseases not only in human beings but also in several other living organisms. Basically, the troposphere which is the nearest aerial layer of earth exhibit the overload of microorganisms. These aerial microorganisms may spread throughout a long distance after being suspended. As they travel long route by air, they can cause several diseases and which spread not only in human beings but also in plants, livestock etc. and lead to severe damage. That is why it can be concluded that these microbial emissions of air can play a vital role in environmental hygiene [2]. Microbes become suspended in the clouds first, then they transform the chemical composition of clouds by causing several chemical reactions [3]. This article covers the effect of bioaerosols on the diseases of human as well as other living organisms.

## PHYSICAL HABITATS IN AIR:

There are two microbial habitats in air-
1. Atmosphere
2. Clouds

1. **Atmosphere:** The layers of atmosphere are differentiated according to intensity of light, variation of temperature and all of these build a non-hospitable environment for microbes. But these can be deposited by gravity that make them to deposited by gravity that make them to contact with earth's surface. By this way the microbes gradually suspend in the lower part of atmosphere.[4]

2. **Clouds:** Clouds are another kind of microbial habitat. Clouds acidic environment favours (PH =3-7) the extremophiles growth and suspension.

## MICROBIAL COMMUNITIES IN AIR:

Several types of microorganisms such as, bacteria, virus, fungi, yeast, and protozoans form aerosols. Then these microorganisms must adapt with the harsh conditions of atmosphere just for survival. As these can survive the extreme condition some of them can form endospore.[5]

**Bacterial:**
Bacillus anthracis, gram positive in nature and it can survive in aerosol [6]. This bacterium is responsible for anthrax which is associated with dangerous respiratory diseases of human.

**Fungal:**
Aspergillus fumigatus is most dangerous aerial fungal pathogen and it is able to cause human lungs diseases when their conidia are inhaled [7]. There are several viral pathogens in aerosol in atmosphere which have the capacity to develop severe diseases in human beings as well as in other animals.

The toxins secreted from airborne microorganisms are highly responsible for severe diseases in human. Lipopolysaccharide (LPS) is one of the most affective airborne toxin that develop from the gram negative bacteria's outer membrane. After getting associated with dust in air the LPS may lead to acute respiratory diseases such as- chest tightness, coughing, fever etc.

## SOURCES OF MICROBES IN AIR:

Although there are lots of microorganisms in air but air is not the natural habitat of all type of microorganisms because it does not constitute perfect moisture and nutrient for the growth of microorganisms. Infectious dust, droplets, industrial aerial emissions are the major sources of microbes in air today. Actually, big sized aerial droplets get dry on-air surfaces. The nasal and throat discharges from a patient can be the major source of infectious dust and it is seen that after getting dried these discharges along with several microorganisms

freely float in the air. Besides this there is also the presence of droplets in air. The vital sources of droplets are sneezing, coughing and talking of patients. The oral discharges along with mucus of those patients can bear lots of severe infectious microorganisms which readily spread in the air and play a vital role in the disease development.
The industrial aerial emissions are full of toxic gases and these gaseous particles are also a major source of infectious microorganisms in air. Atmospheric humidity, temperature are the major controllers of survival of microorganisms in air.

**Human diseases caused by airborne microbes:**

**Bacteria:**

i. Brucellosis caused by *Brucella melitensis*
ii. Pulmonary anthrax caused by *Bacillus anthracis*
iii. Typhoid fever caused by Salmonella typhi
iv. Whooping cough caused by *Bordetella pertusis*
v.Legionellosis caused by *Legionella* spp.

**Fungi:**

i.Aspergillosis caused by *Aspergillus fumigatus*
ii.Cryptococcosis caused by *Cryptococcus neoformans*
iii.Nocardiosis caused by *Nocardia aesteroides*

**Virus:**

i.Influenza caused by Influenza virus
ii.Common cold caused by Rhino virus
iii.Rubella caused by Rubi virus
iv.Measles caused by Morbill virus

## CONCLUSION:

Aero-microbiology is that branch which helps to study the role of aerial microorganisms. No doubt it helps to concentrate on their critical role of microbes on disease development in human beings. There are lots of diseases which spread through airborne microorganisms. In this review paper we have focused on the presence of microorganisms in air, their role in several disease development and several sources of microorganisms in air. The purpose was to discuss on the airborne microbes and their critical roles on disease development.

## REFERENCES:

1.Brandl, Helmut, et al. "Short-Term Dynamic Patterns of Bioaerosol Generation and Displacement in an Indoor Environment." International Journal of Aerobiology (Oct. 2008): n. pag. Academic Search Premier. Web. 1 Apr. 2012.
2.Robinson, Marguerite, Nikolaos Stilianakis, and Yannis Drossinos. "Spatial Dynamics of Airborne Infectious Diseases." Journal of Theoretical Biology 297 (Mar. 2012): 116-126. Print
3.Amato, Pierre. "Clouds Provide Atmospheric Oases for Microbes." Microbe Magazine: n. pag. American Society for Microbiology. Web. 1 Apr. 2012.
4.Pepper, Ian L., and Scot E. Dowd. "Aeromicrobiology." Environmental Microbiology. N.p.: Academic Press, 2009. 83-101. Print.
5.al-Dagal, M., & Fung, D. Y. (1990). Aeromicrobiology--a review. Critical Reviews in Food Science and Nutrition, 29(5), 333-340.
Retrieved from www.scopus.com
6.Gatchalian, N.G., et al. "Dry Thermal Resistance Of Bacillus Anthracis (Sterne) Spores And Spores Of Other Bacillus Species: Implications For Biological Agent Destruction Via Waste Incineration." Journal Of Applied Microbiology 109.1 (2010): 99-106. Academic Search Premier. Web. 22 Apr. 2012.
7.McCormick, Allison, Jürgen Loeffler, and Frank Ebel. "Aspergillus Fumigatus: Contours Of An Opportunistic Human Pathogen." Cellular Microbiology 12.11 (2010): 1535-1543. Academic Search Premier. Web. 22 Apr. 2012.