



Aerobiology and the Salton Sea

Sumaya Troy Alaama
 Division of Biomedical Sciences
 University of California, Riverside

Abstract

Aerobiology is the study of the movement of microorganisms from one location to another. This process involves an interplay of factors such as particle size and desiccation. In the Salton Sea region, diverse microbial communities influence air quality and ecosystem dynamics. As the Salton Sea recedes and atmospheric dust levels rise, the dispersal of microorganisms becomes a critical concern for human health. Understanding these aerobiological dynamics is essential for effective disease management and ecosystem conservation in the Salton Sea area and beyond.

Introduction

It is common knowledge that we should cover our mouths when we cough or sneeze to prevent the transmission of diseases, but how is it that we understand the process by which microorganisms are transmitted from one location or person to another? We understand this through the study of aerobiology or the study of the processes involved in the movement of microorganisms from one geographical location to another. Aerosolized transmission occurs through “droplet” and “airborne” transmission.

Droplet transmission is defined as the transmission of diseases by expelled particles that are likely to settle onto a surface quickly, where a susceptible individual must be close enough to the droplet to make contact with their respiratory tract, eyes, mouth, nasal passages, and so forth. Airborne transmission is defined as the transmission of infected by expelled particles that are comparatively smaller in size and thus can remain floating in the

air for long periods of time, potentially exposing a much higher number of susceptible individuals at a much greater distance from the source of transmission. Depending on environmental factors, airborne particles are easily measured 20 meters from their source, and these factors can include airborne bacterial, viral, and fungal particles that are often infectious. It is also important to note that droplet and airborne transmission are not mutually exclusive, so particles carrying infectious microorganisms do not exclusively disperse by airborne or droplet transmission, but by both methods simultaneously.

Transmission of infectious disease by the airborne route is dependent on the interplay of several critical factors, such as particle size and the extent of desiccation. In regards to particle size, large particles fall out of the air while small particles remain airborne. Similarly, the size of the particle dictates where they will deposit after

inhalation into the respiratory tract, where smaller particles get deeper into the lungs, while larger particles deposit in the upper airways. In regards to desiccation, the process by which moisture is

removed, particles immediately begin desiccating upon expulsion into the air, allowing them to become smaller and lighter and increasing the length of time they can remain airborne.

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Microorganisms that live in and around the Salton Sea, surrounding playa and wetlands, and nearby agricultural systems, have an impact on the air quality of the region. As the Sea recedes due to reduced water inputs in all scenarios, it exposes additional playa and increases atmospheric dust levels. Similarly, in fallow agricultural fields and disturbed ecosystems nearby, topsoil can be transported into the air as dust. In addition, due to intense wind eddies that occur frequently over the Salton Sea, sea spray can be transported as well

with the dust. Dust and sea spray from these diverse sources are composed of organic and inorganic materials, including adhering microbes, which can be transported locally or long distances, even between continents. As these materials are picked up and transported, microorganisms on particles are also transported into the air. The composition of this microbial community in the air can have an impact on the functioning local ecosystems, potentially impacting human health.

References

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