# WHERE DO BIOAEROSOLS COME FROM?

## NATURAL SOURCES OF BIOAEROSOLS INCLUDE:

- aquatic – marine, freshwater
- terrestrial – soils, desert dust
- natural activity of fungi and other microorganisms
- plants – pollen
- insects
- animals – including humans

## HUMAN ACTIVITIES THAT PRODUCE BIOAEROSOLS INCLUDE:

- housework – cooking, cleaning, vacuuming
- flushing the toilet
- composting
- wastewater treatment
- farming
- disposing waste in landfills

**Bioaerosols are everywhere!** They can be found in the freezing Antarctic right up to heights of the stratosphere at >30 km altitude (that is more than twice the cruising height of a 747-jumbo jet).

Bioaerosols have been reported to contribute as much as 25% of the total mass of atmospheric particulate matter (a mixture of solid particles and liquid droplets found in the air), and they play a prominent role in climate, ecosystem health, and atmospheric processes. For example, acting as 'cloud condensation nuclei', microbial bioaerosols influence the weather by promoting rainfall.

Overall, there is a wide variation in the concentration of bioaerosols in different environments that not only vary with geographical location but also depend on a wide range of biological and non-biological factors.

Natural processes (sea spray, wind, pollination, animal movements on soil, rainfall, and desert dust) generate bioaerosols. The composition of bioaerosols released from soil, is highly dependent on the type of soil and bioaerosol dissemination achieved by raindrops or any other soil agitation.

The type and number of microorganisms in bioaerosols are affected by environmental factors (seasonality, geography, and time of the day) and meteorological conditions (temperature, humidity).

Many larger organisms may produce bioaerosols. For example, airborne dispersal of small biological particles (e.g., pollen) is a key part of the life cycle for many plants. It is also a natural and necessary part of the life cycle of many microorganisms. Many fungi, in particular, produce spores that are released into the air, enabling them to disperse to new environments.

Humans and animals are also an important source of bioaerosols (mainly bacteria and viruses) through the shedding of skin flakes into the air. Human activities (such as talking, sneezing, coughing, walking, washing, and toilet flushing) cause particles to be resuspended and are another important source.

Many human activities are also principal emission sources of bioaerosols into the atmosphere. Urban areas and industrial activities (e.g., agricultural production, manure spreading, livestock raising, food processing, wastewater treatment systems and waste sorting) emit large amounts of bioaerosols, potentially dispersing harmful bioaerosols (e.g., pathogens, sensitizers). Indeed, occupational exposure is a great concern as air quality has a direct effect on human health, and workers may be exposed to large concentrations of bioaerosols.