



Green Week 2013

Session 2.3



Bioaerosols – a new threat?

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Aerosols

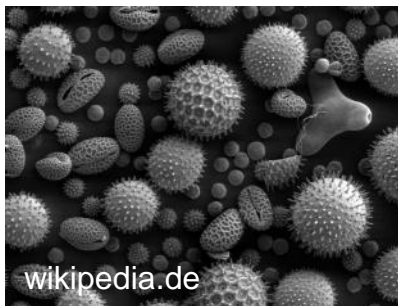
- Very small (nm to μm)
solid particles or liquid droplets dispersed in air (gas)





Bioaerosols

- Aerosols containing particles or substances of biological origin e.g.:
 - pollen from plants (10-100 μm)
 - microorganisms:
 - bacteria, fungi (1-10 μm)
 - viruses (10-100 nm)
 - parts of microorganisms/plants
 - microbial substances (e.g. endotoxin, mycotoxin)
 - substances from of animals (cat, dog, mite, cockroach)

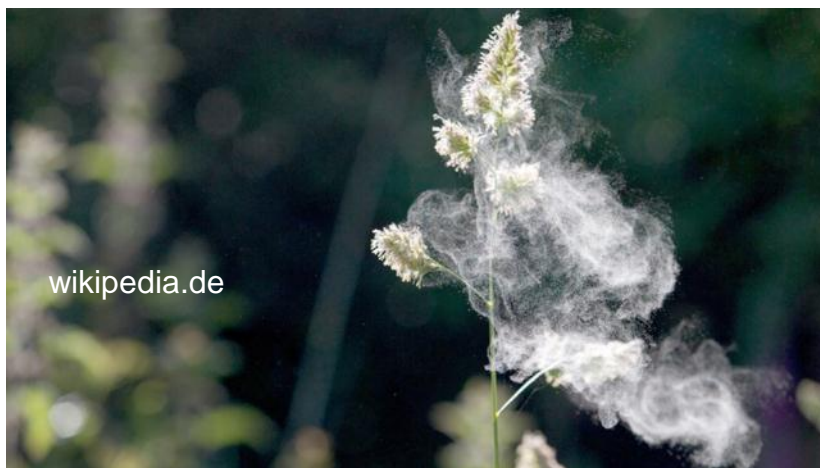


wikipedia.de

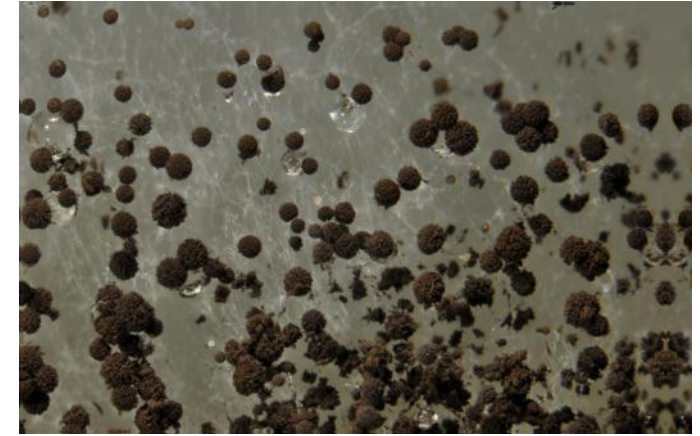


Natural Bioaerosols I

- Pollen
Part of the life cycle of plants

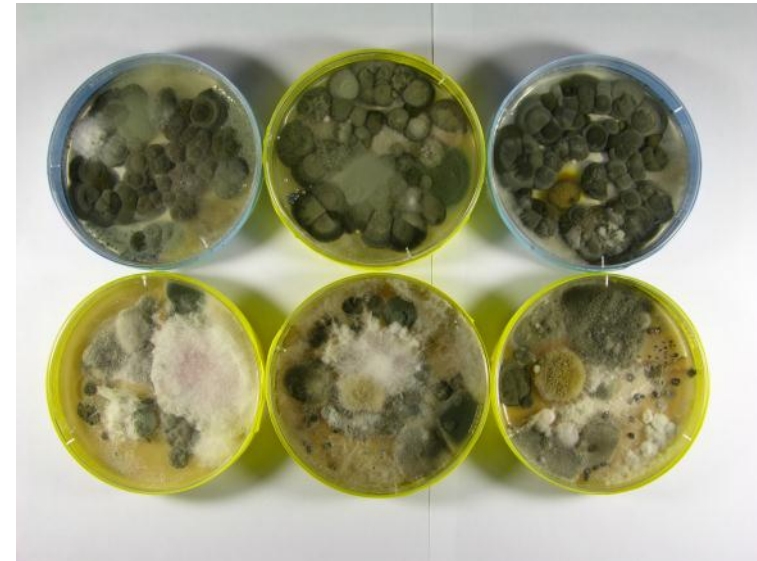
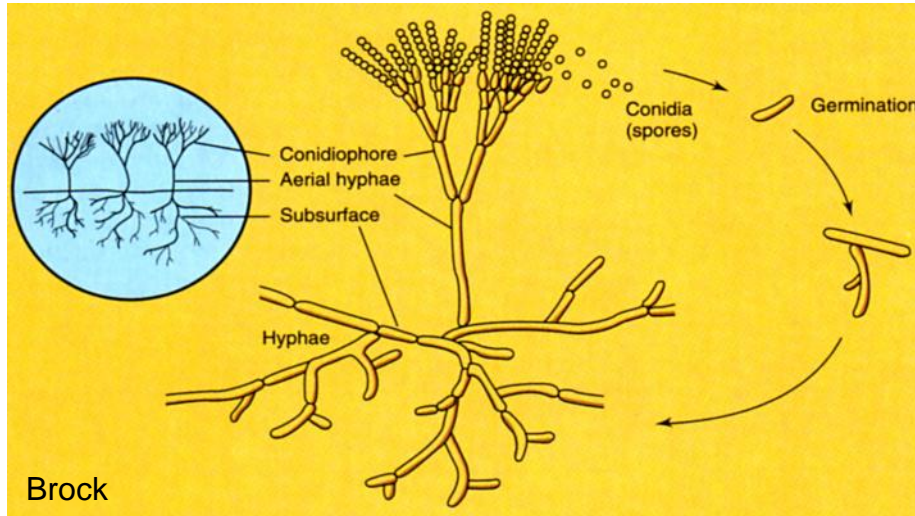


wikipedia.de



Natural Bioaerosols II

- Spores
Part of the life cycle of fungi





Natural Bioaerosols

- Clearance mechanisms
- Allergic reactions
 - hay fever
 - 10 % of children in German health survey
 - 5 % of children in German environmental survey sensitised to *Alternaria alternata*



WikimediaCommons

Ambrosia



Man-made Bioaerosols I

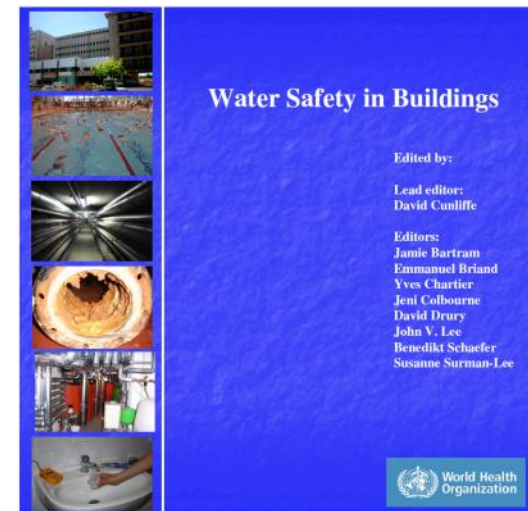
- *Legionella* in aerosols from showers pools/spas and cooling towers



- **Health risks:** lung inflammation, death
- CAPNETZ study in Germany:
 - 15,000 to 30,000 cases/year
 - 1,500 to 3,000 death/year



Medical Illustration
Central Public Health Laboratory,
UK

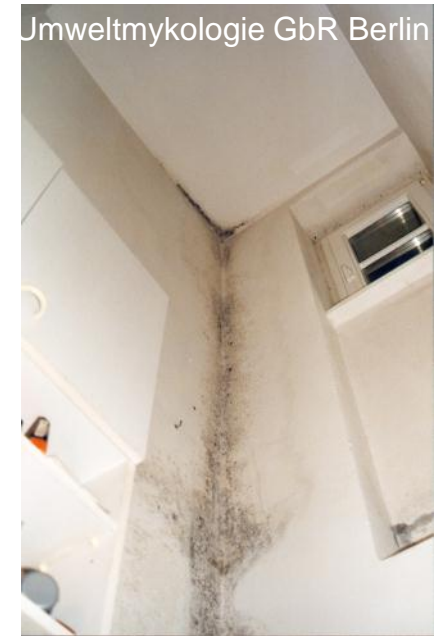


http://www.who.int/water_sanitation_health/publications/2011/9789241548106/en



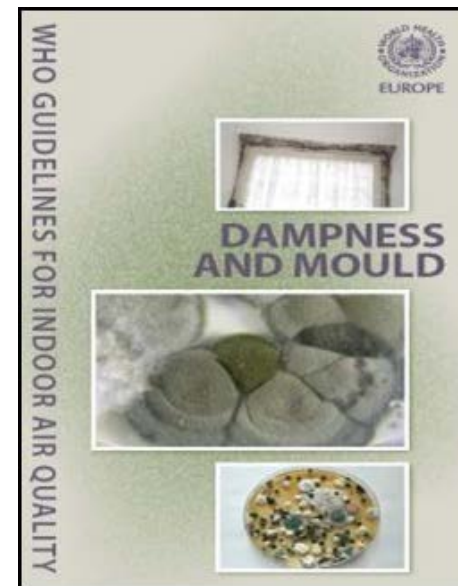
Man-made Bioaerosols II

- **Very high bioaerosol concentrations at work places**
- **Health risks:** problems with lung and mucous membranes:
 - ODTS (organic dust toxic syndrome e.g. humidifier fever)
 - EEA (extrinsic allergic alveolitis e.g. farmer`s lung)
 - MMI (mucous membrane irritation)
 - chronical bronchitis

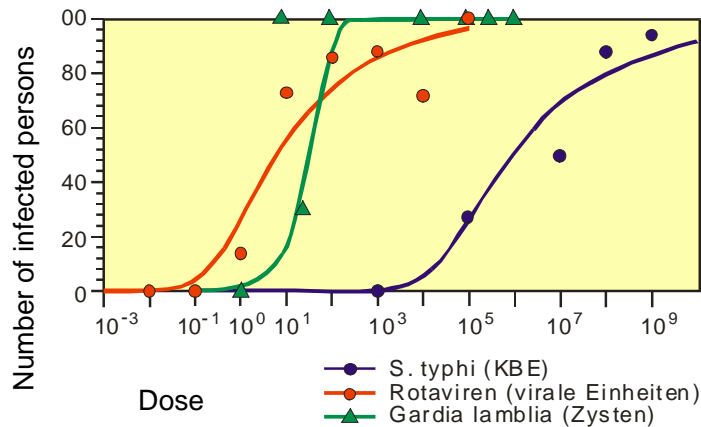


Man-made Bioaerosols III

- Elevated concentrations in the environment
- **Indoor Air: Damp and mouldy buildings**
- **Health risks:**
 - allergic reactions
 - upper respiratory tract symptoms
 - cough, wheeze
 - asthma exacerbation
 - unspecific health problems?
- **Problem:**
no dose-response relationship
causative agents not known



Man-made Bioaerosols III



Dose-response relationship
for pathogens in water

- No dose-response relationship for bioaerosols → no limit values
- Solution: additional bioaerosols from damp and mouldy conditions indoors are not acceptable
- Comparison with natural concentrations



Man-made Bioaerosols IV

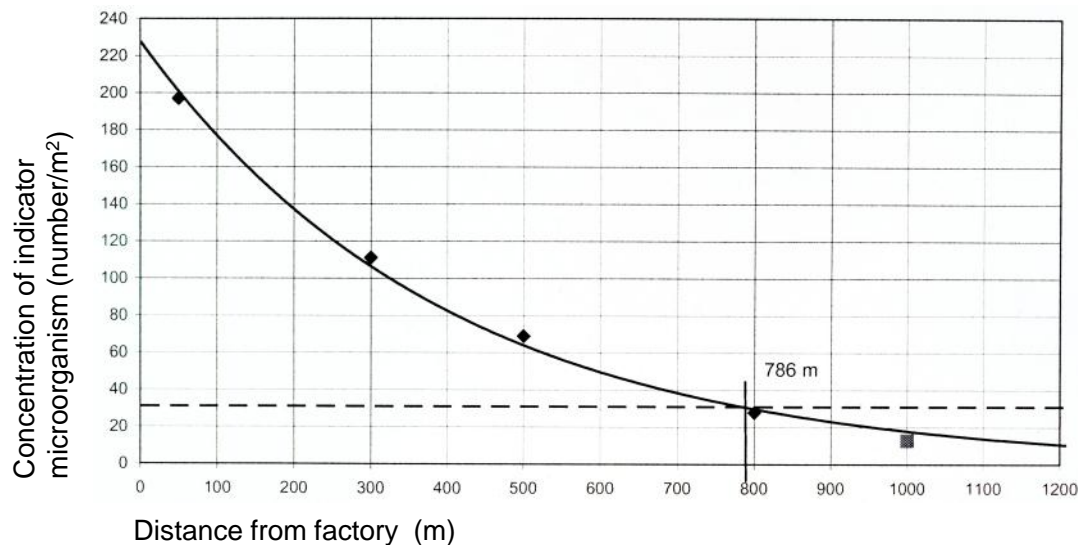
- Elevated concentrations in the environment – **Ambient Air**
- **Recycling** facilities (e.g. composting)
- Intensive **mass animal farming**
- **Health risks:**
- Studies have indicated health effects in adjacent residential areas esp. in persons with atopic disorders
- Antibiotic resistant bacteria





Man-made Bioaerosols IV

- No dose-response relationship → no limit values
- Solution: Additional bioaerosols from factories are not acceptable in residential areas
- Comparison with natural concentrations





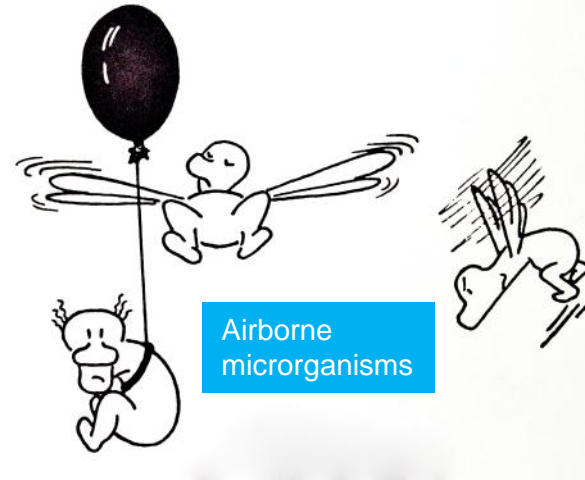
Summary

- Bioaerosols an old threat -
with new anthropogenic (man-made) aspects
- Bioaerosols can cause health problems
- Measures should be taken to minimize bioaerosol concentrations
 - at work places,
 - indoors (mouldy buildings) and
 - in ambient air
(recycling industry, intensive mass animal farming)



Summary

- What concentrations are acceptable?
- Problem:
no dose-response relationship → no limit values
- Solution:
concentrations above the background level should be considered a potential health problem
(precautionary principle)
- Positive effects of (farm) bioaerosols:
exposure in early life → protective effect on allergy/asthma
- More research needed



Thank you for
your attention

