



Utah Department of
Environmental Quality

CLEARANCE OF PARTICULATE MATTER FROM THE LUNGS

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What is Particulate Matter (PM)

- PM is a mixture of:
 - Acids
 - Metals
 - Organic chemicals
 - Soil or dust particles
- Particles which are 10 micrometers in diameter or smaller are of particular concern
 - These can be inhaled into the lungs



The Lung's Clearance Mechanisms

- Once inhaled, the body's natural defense system is activated to process foreign substances
- Three important mechanisms for defense include:
 - Lung lining fluid
 - Mucociliary escalator
 - Macrophages



Lung Lining Fluid

- Likely the most important mechanism of our lung's defense system composed of:
 - Water
 - Antioxidants
 - Enzymes
 - Lipids
 - Proteins



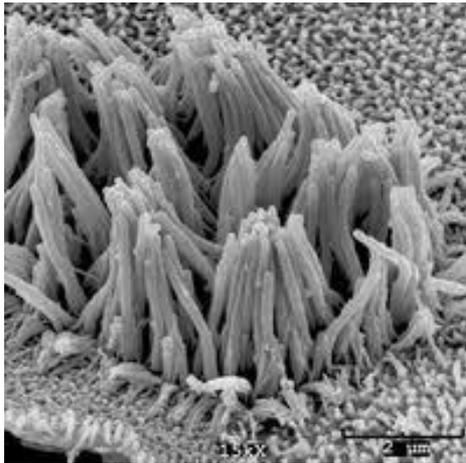
Lung Lining Liquid

- Fluid has antimicrobial properties
- Particles > 5 micrometers are trapped in the lining-fluid of the airways
- The high water content allows for the transfer of momentum from the beating cilia to the mucus “blanket” in the escalator system



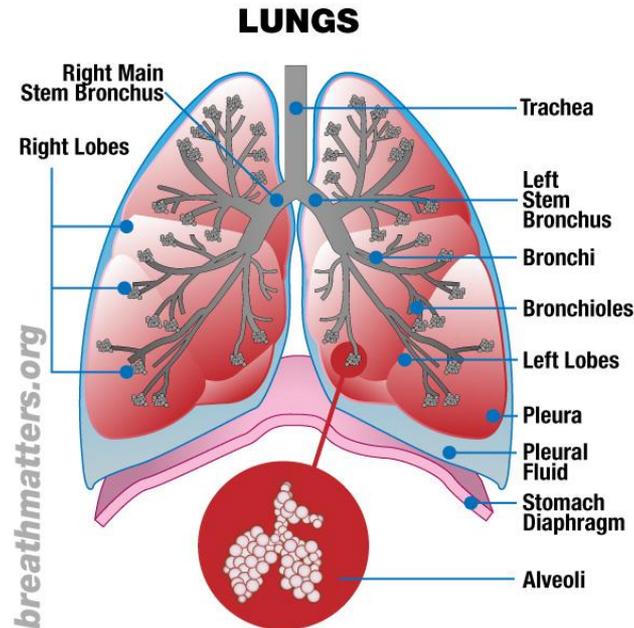
Mucociliary Escalator

- Particles deposited in the upper airways are removed by the mechanical upward-beating fibers of cells that line the airways
 - The particles move upward until they can be swallowed and excreted from the body



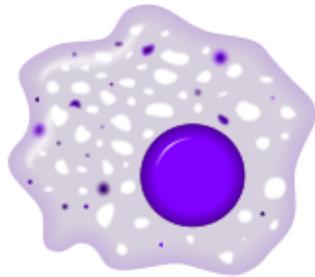
Macrophages

- Some particles are inhaled into the terminal airways (alveoli)



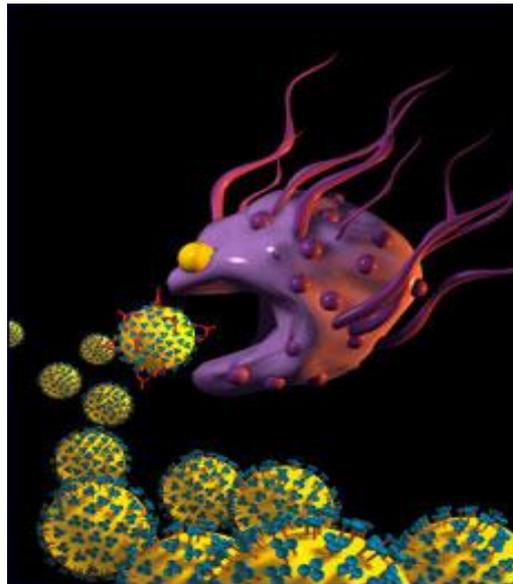
Macrophages

- Signaling chemicals are released by Macrophages that attract other macrophages and inflammatory cells



Macrophages

- Usually, macrophages ingest particles in the airways before the particles can be transported into the lung tissue or blood vessels.



Macrophages

- Particles that escape initial ingestion by macrophages can get transported into the lung tissue by cells lining the airways
- Macrophages residing the tissues will then be able to ingest and process the particles



References

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