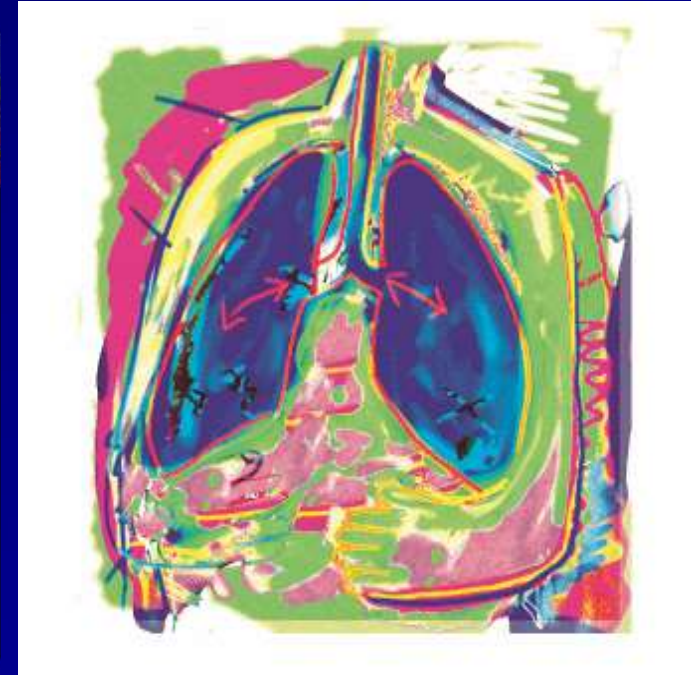
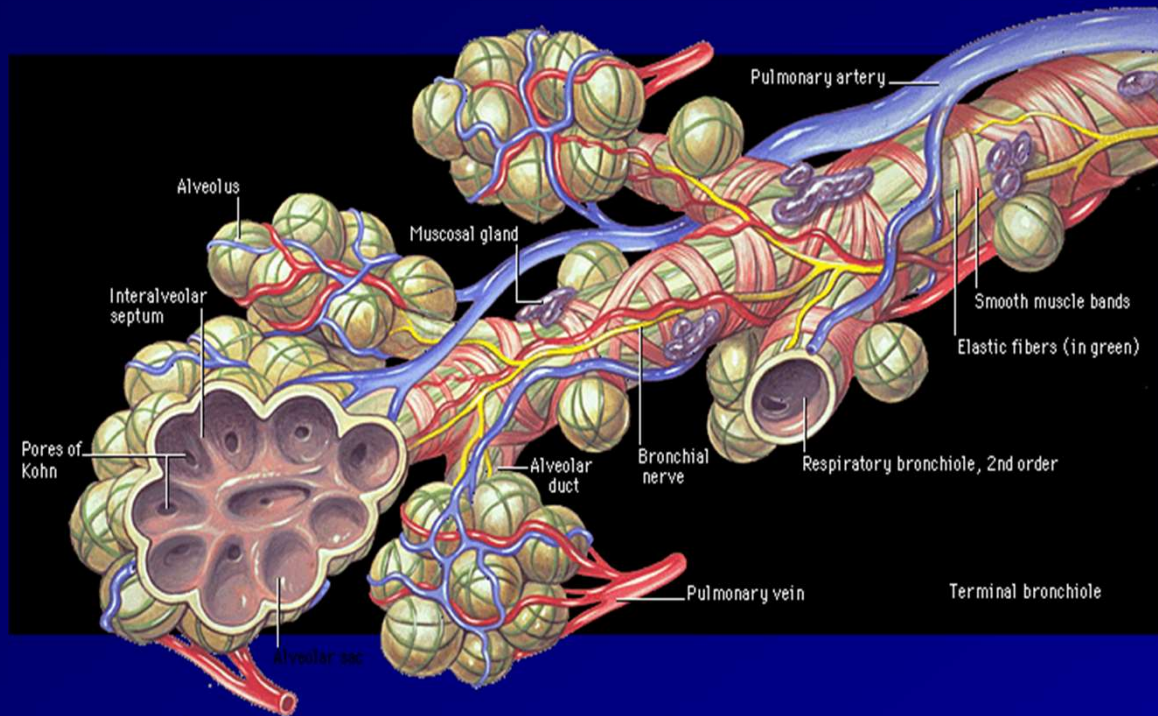


# Immunity and Autoimmunity in Occupational Lung Diseases



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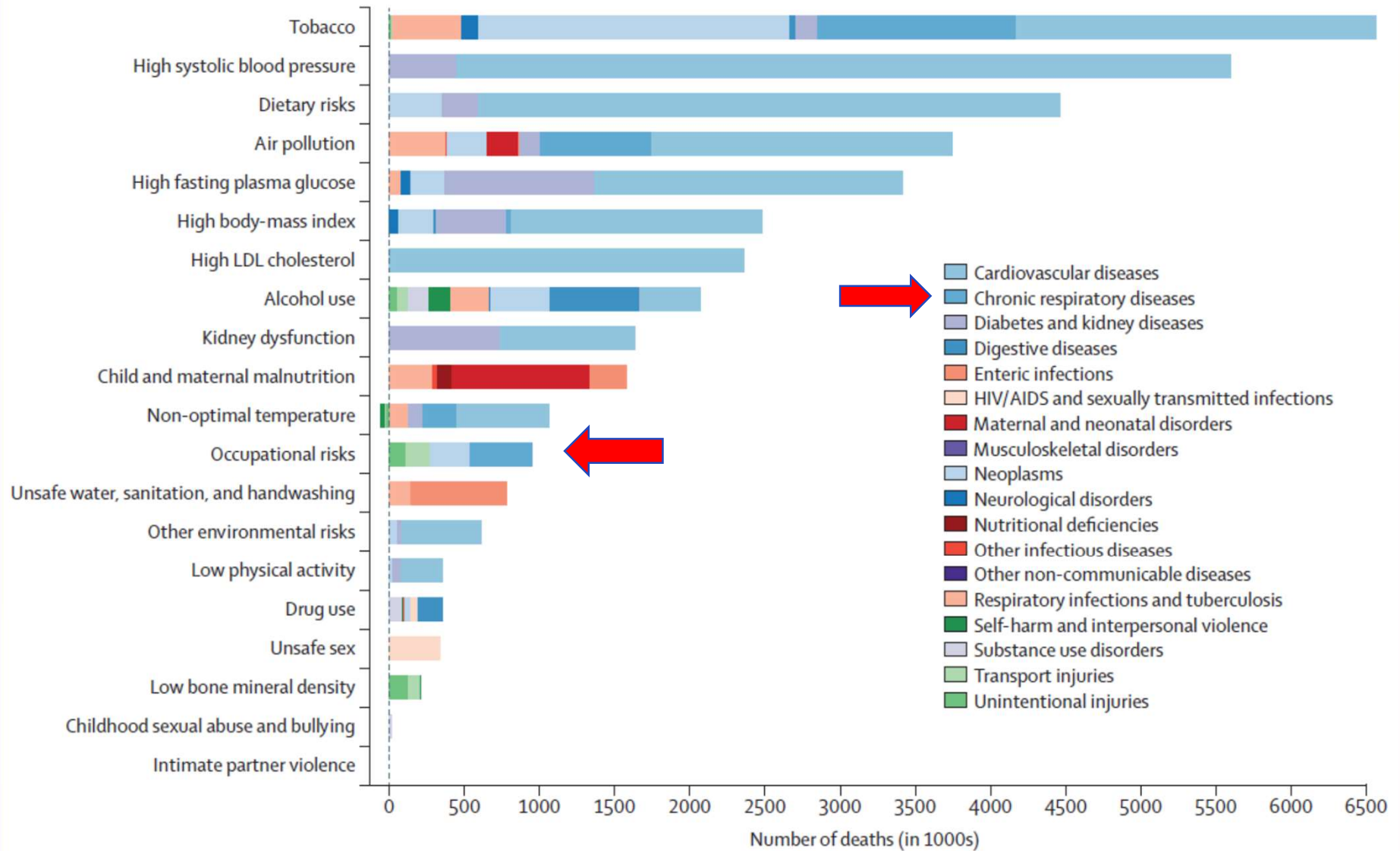
# Burden Malattie Respiratorie

- In UE 1/8 decessi dovuto a malattia respiratoria (660.000 decessi/anno)
- 6 milioni di ricoveri/anno, 43 milioni di giornate di degenza
- Ai primi posti Cancro del polmone, BPCO, Infezioni Respiratorie
- Mortalità BPCO nel mondo al 3° posto; nel 2030 morti per polmonite, TBC, cancro polmone e BPCO 1/5 della mortalità mondiale

# Occupational Factors in Respiratory Diseases

- Occupational exposure is a potential cause of almost all respiratory diseases:
  - Asthma 2-15%
  - COPD 15-20%
  - Lung Cancer 15%

**B** Global attributable deaths from Level 2 risk factors for males in 2019



Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017

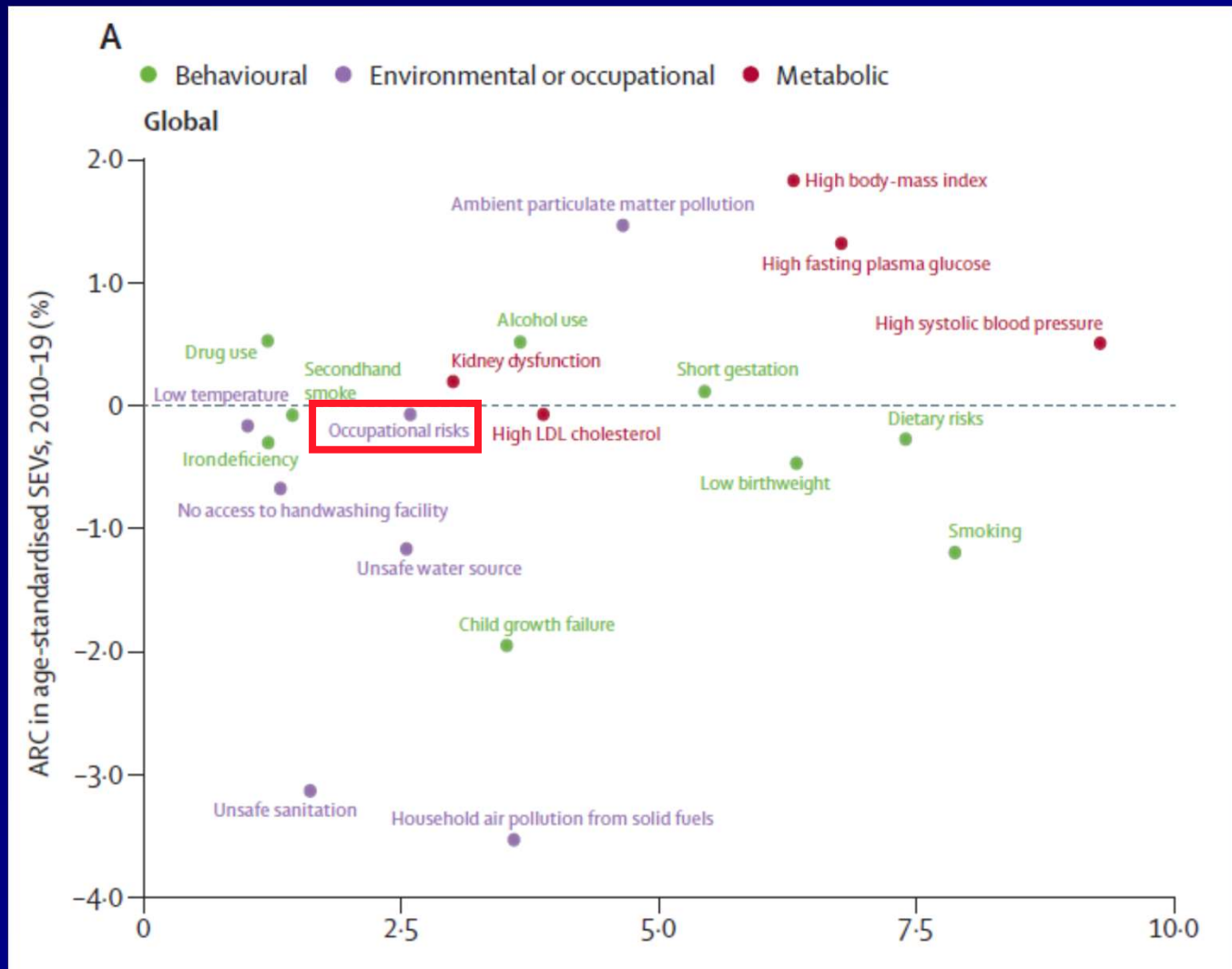
Lancet 2018; 392: 1736–88

	All-age deaths (thousands)	
	2017	Percentage change, 2007–17
Chronic respiratory diseases	3914.2 (3790.6 to 4044.8)	15.8% (12.7 to 19.3)*
Chronic obstructive pulmonary disease	3197.8 (3029.0 to 3358.9)	17.5% (13.3 to 21.1)*
Pneumoconiosis	21.6 (20.5 to 22.7)	10.7% (5.1 to 16.6)*
Silicosis	11.3 (10.4 to 12.5)	12.0% (1.2 to 22.8)*
Asbestosis	3.4 (2.3 to 3.9)	23.3% (15.1 to 33.9)*
Coal worker pneumoconiosis	3.2 (2.9 to 4.0)	-2.2% (-12.0 to 11.7)
Other pneumoconiosis	3.6 (3.1 to 4.5)	8.9% (0.0 to 25.4)*
Asthma	495.1 (338.2 to 641.2)	-0.7% (-6.2 to 8.1)
Interstitial lung disease and pulmonary sarcoidosis	147.6 (114.9 to 181.3)	49.8% (39.0 to 58.6)*
Other chronic respiratory diseases	52.1 (45.9 to 59.6)	21.3% (14.1 to 34.2)*

# Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019

GBD 2019 Risk Factors Collaborators\*

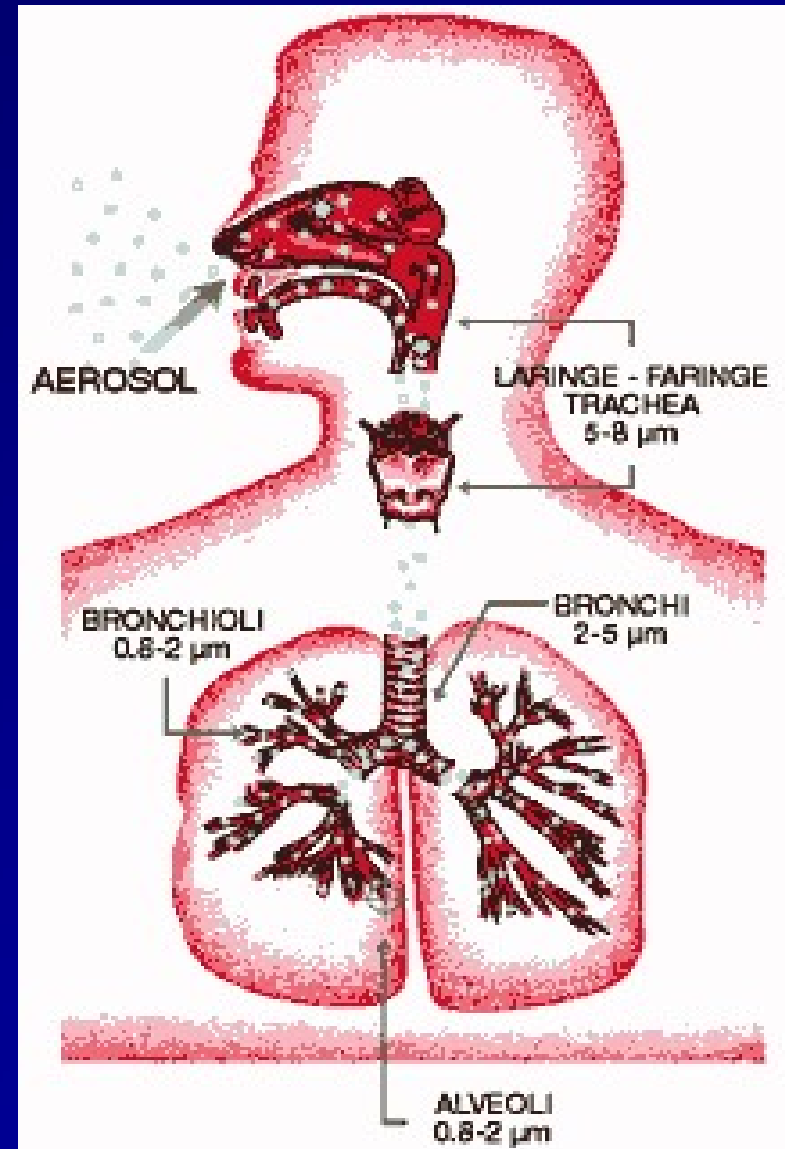
Lancet 2020; 396: 1223–49

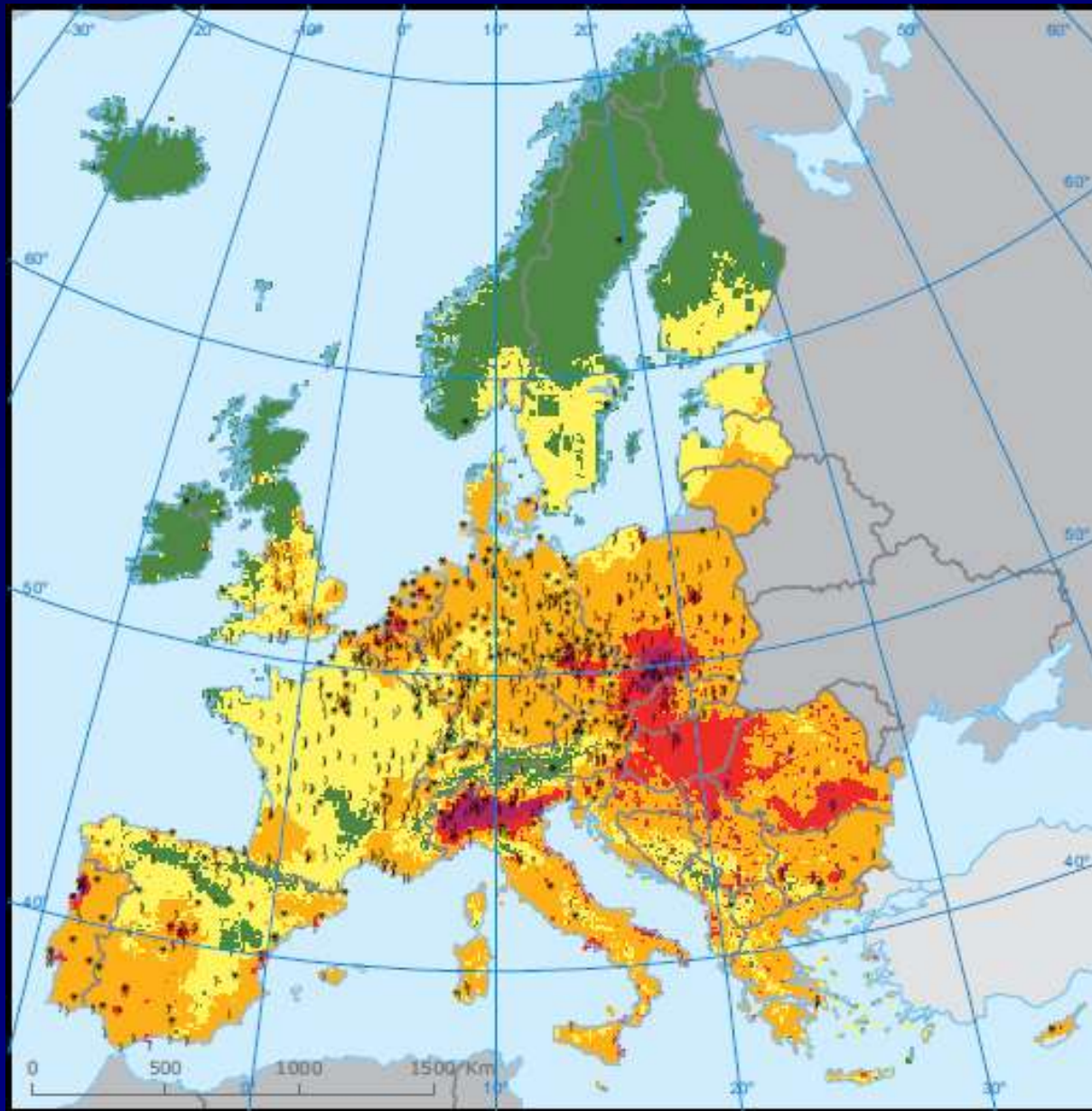


**Interpretation** Overall, the record for reducing exposure to harmful risks over the past three decades is poor. Success with reducing smoking and lead exposure through regulatory policy might point the way for a stronger role for public policy on other risks in addition to continued efforts to provide information on risk factor harm to the general public.

# Airbone Burden

- ✓ Il polmone sopporta un enorme carico immunologico e non da patogeni, allergeni e inquinanti presenti negli 11.000 litri di aria inalata ogni giorno





### Particulate Matter (PM<sub>10</sub>)

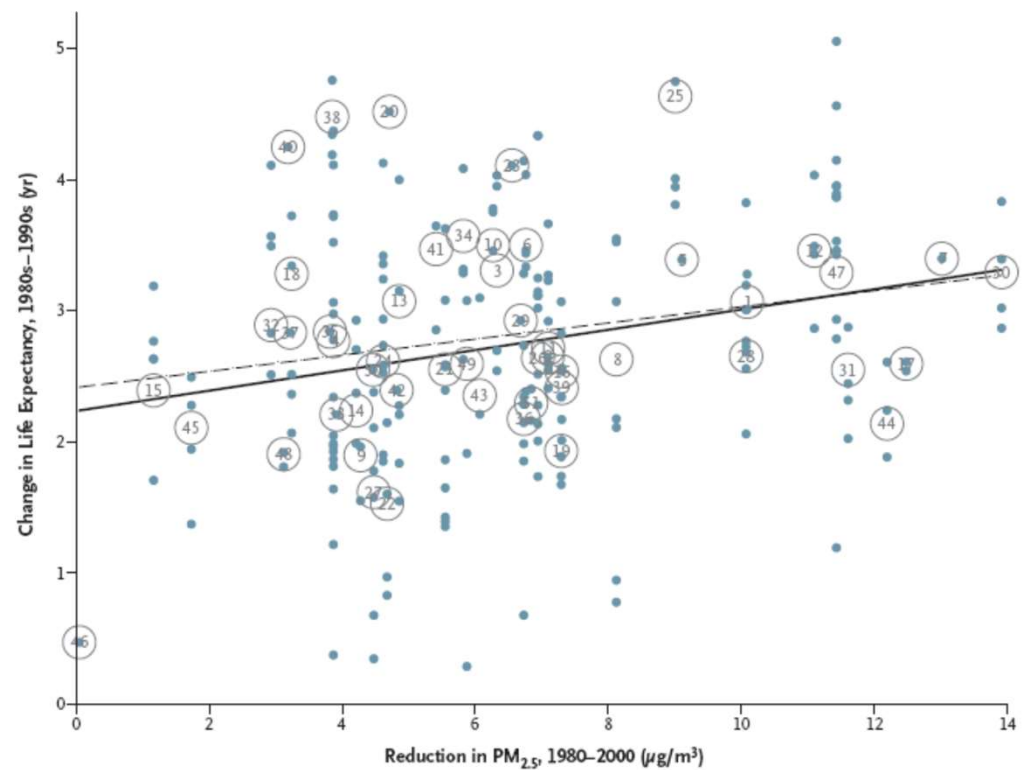
36<sup>th</sup> Highest Daily Value  
 Reference Period: 2005  
 Combined Rural and Urban Map

- = 20  $\mu\text{g.m}^{-3}$
- 20 - 30  $\mu\text{g.m}^{-3}$
- 30 - 50  $\mu\text{g.m}^{-3}$
- 50 - 65  $\mu\text{g.m}^{-3}$  (> LV)
- > 65  $\mu\text{g.m}^{-3}$
- Countries excluded from study
- Countries with few ozone data
- Rural background station
- Urban background station

SPECIAL ARTICLE

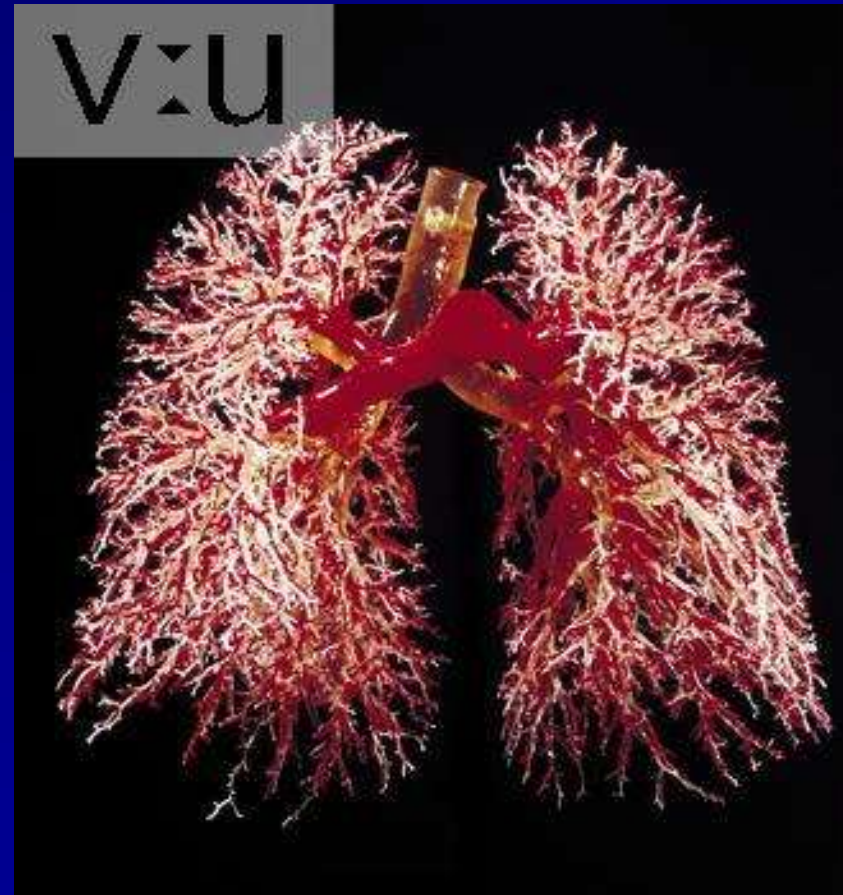
# Fine-Particulate Air Pollution and Life Expectancy in the United States

C. Arden Pope III, Ph.D., Majid Ezzati, Ph.D., and Douglas W. Dockery, Sc.D.

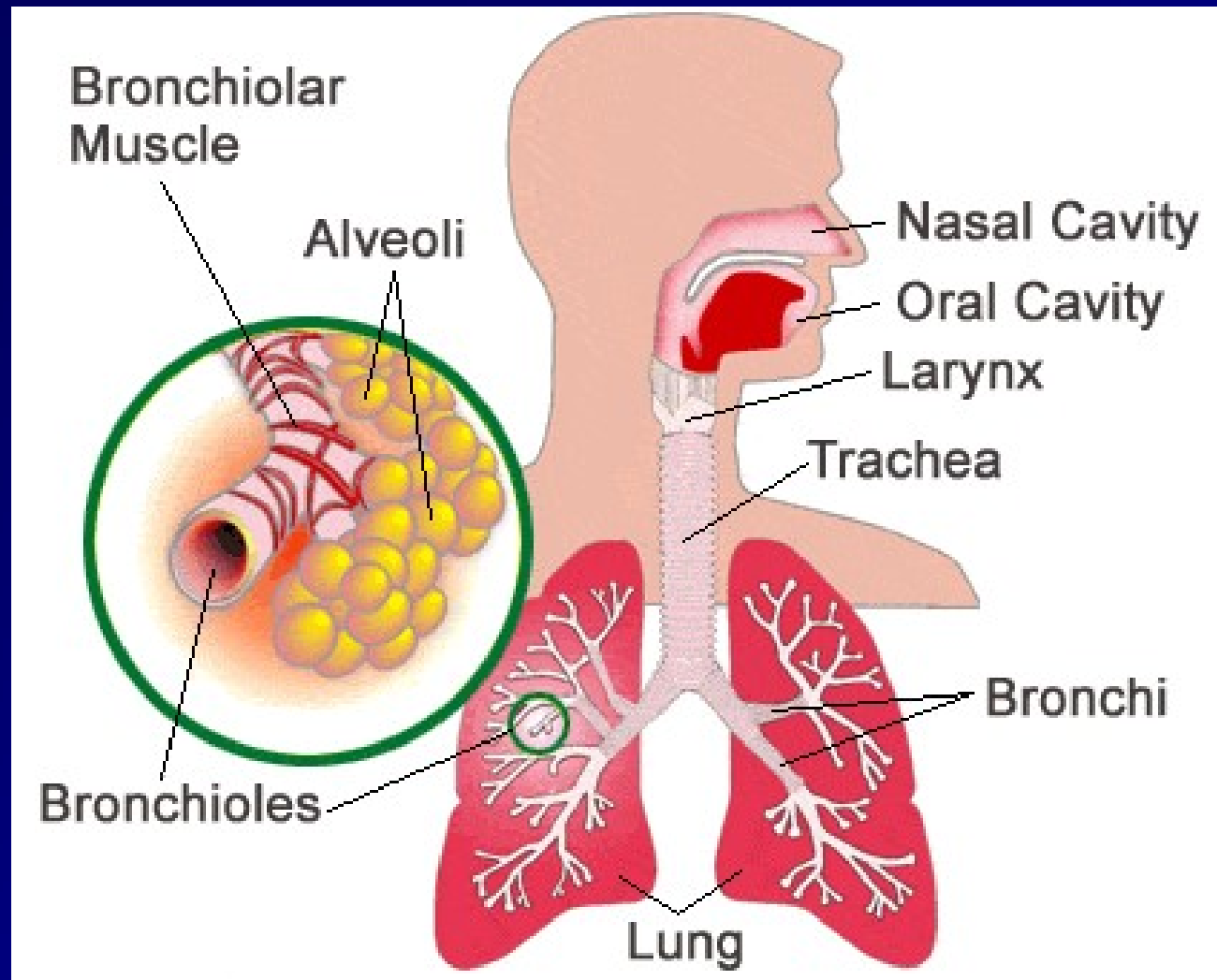


**Figure 4.** Changes in Life Expectancy for the 1980s-1990s, Plotted against Reductions in PM<sub>2.5</sub> Concentrations for 1980-2000.

# *Difesa Naturale del Polmone ed Infiammazione*



# Vie Aeree Superiori e Distali

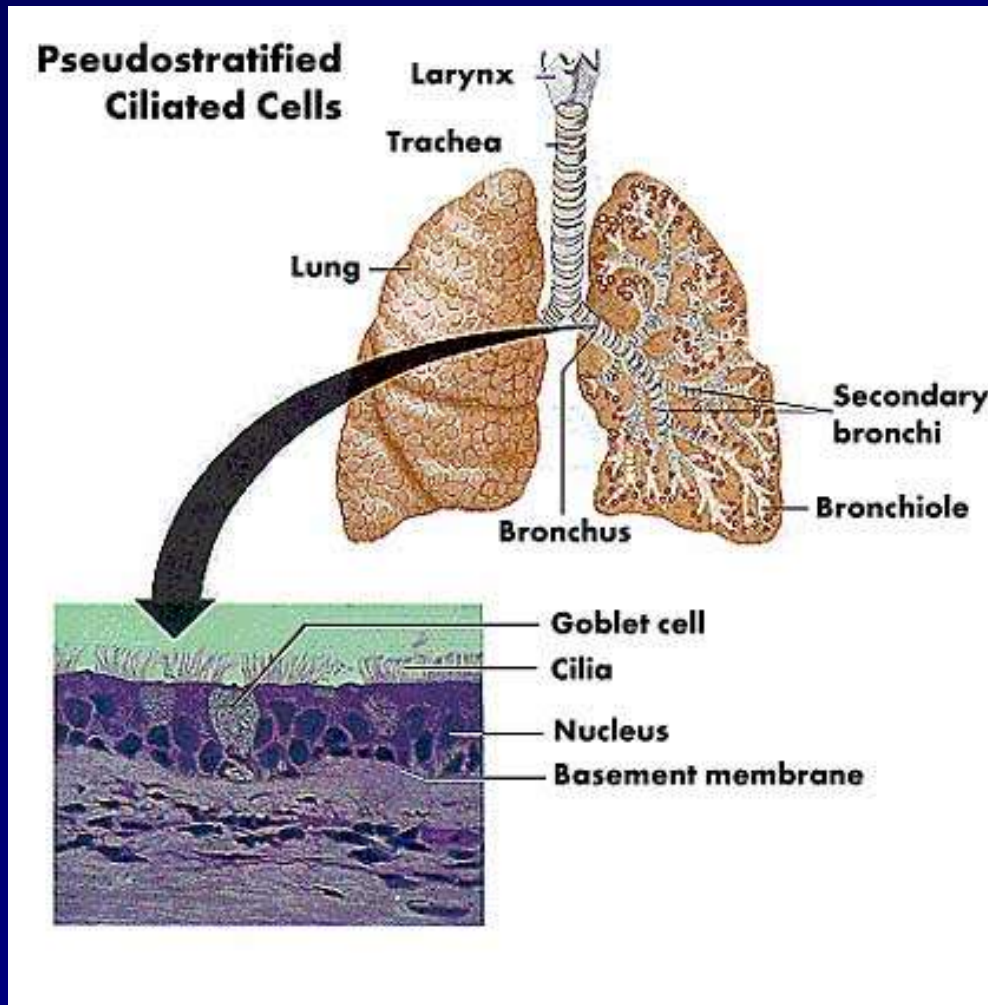


Particelle > 10 u

Particelle 5-10 u

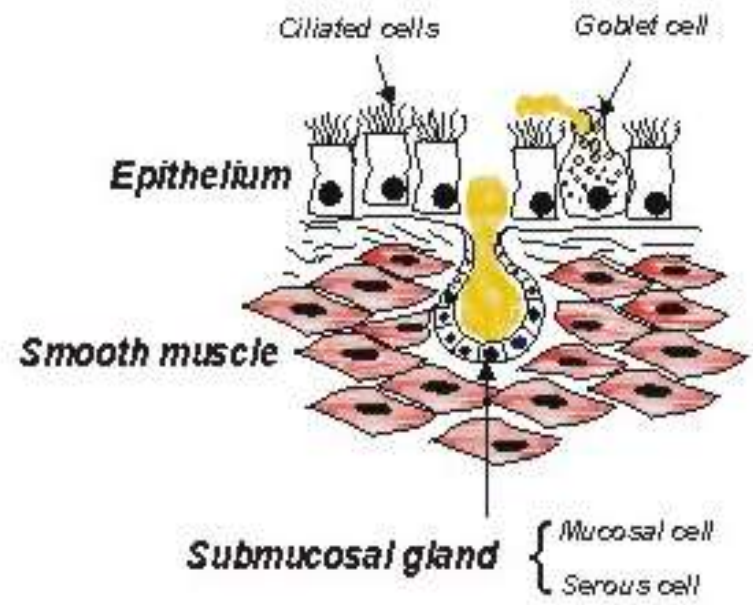
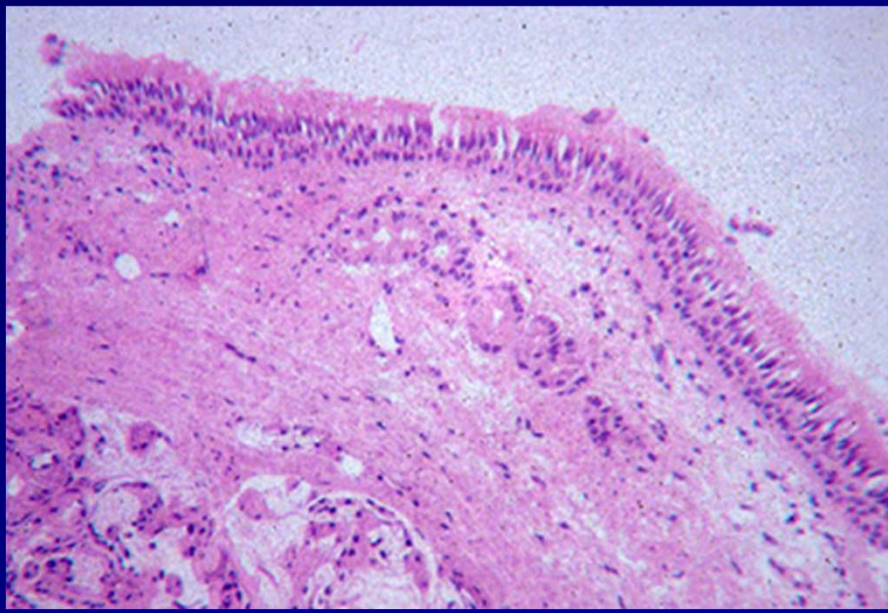
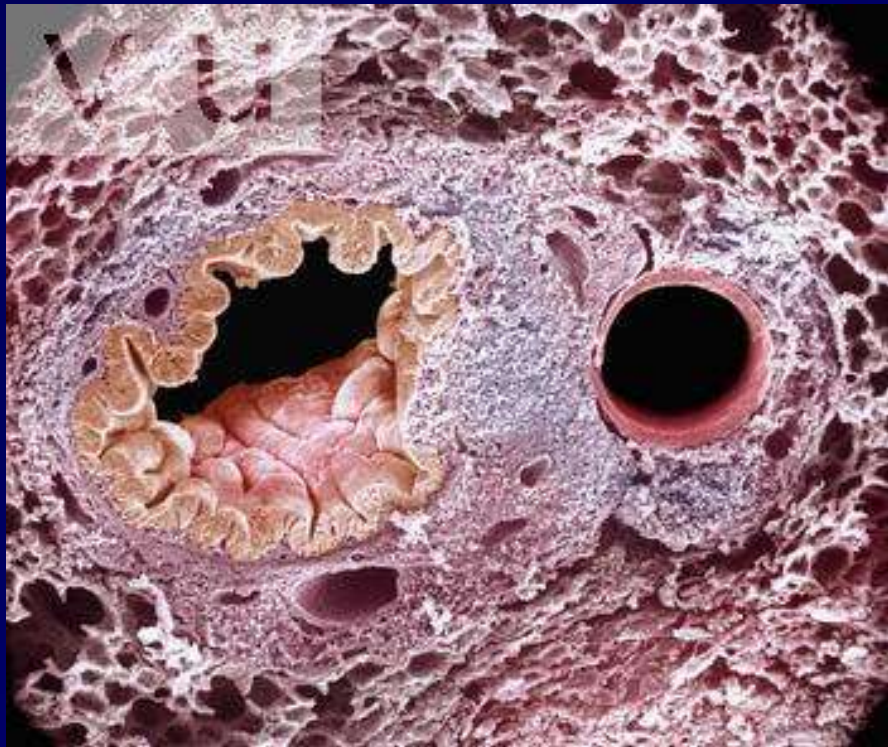
Particelle < 2 u

# Vie Aeree Superiori

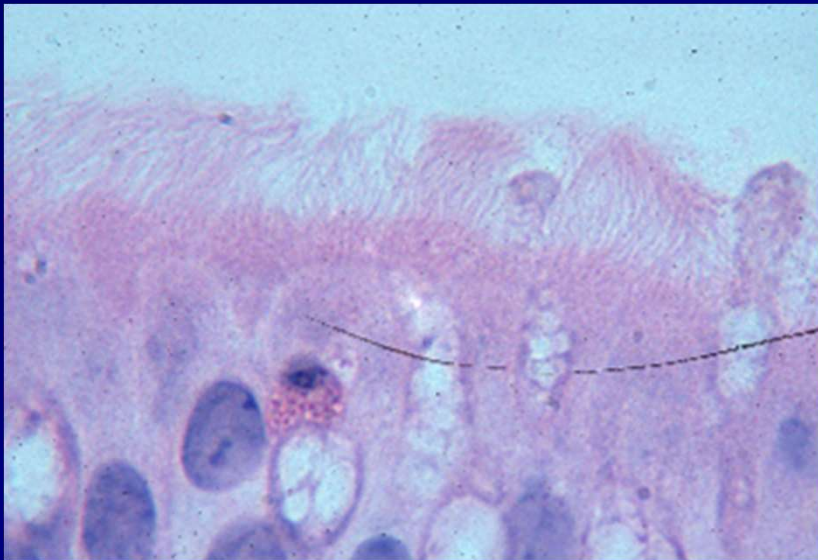
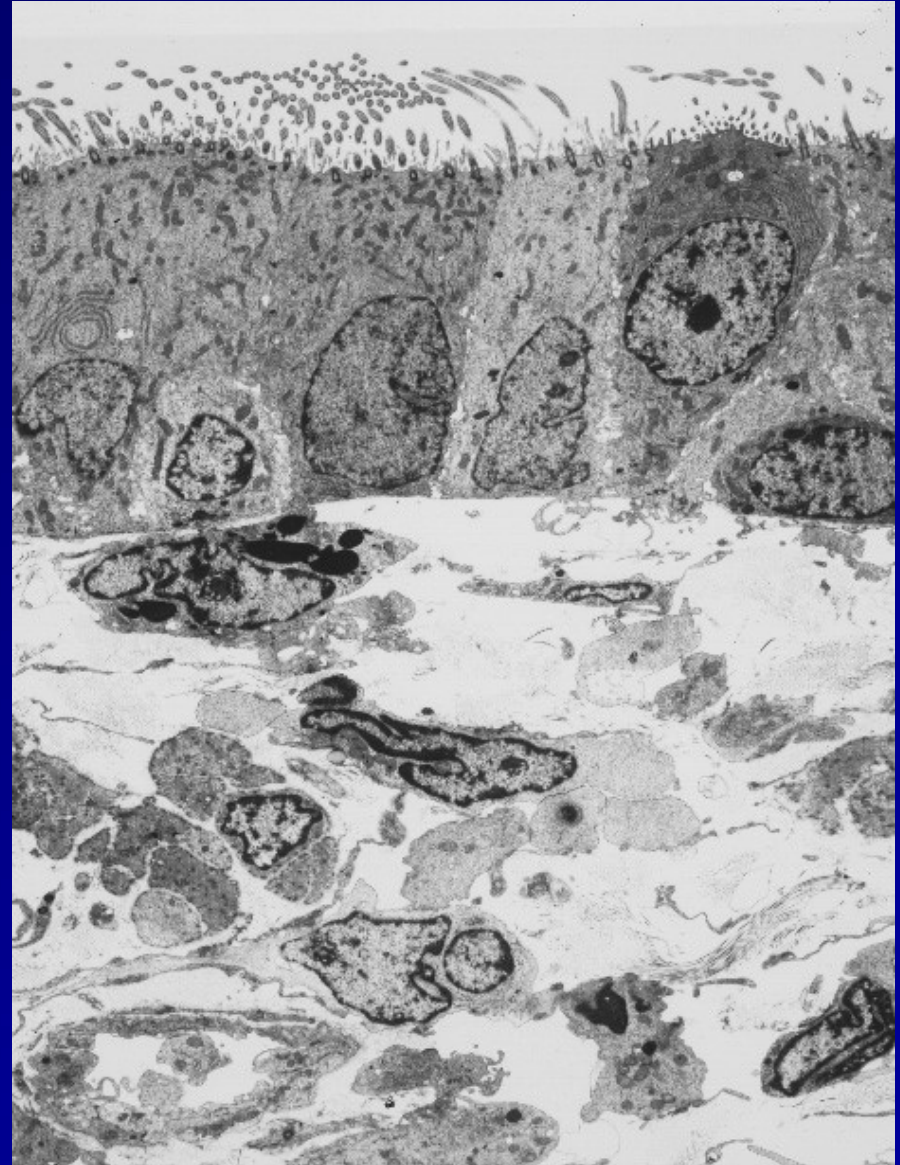
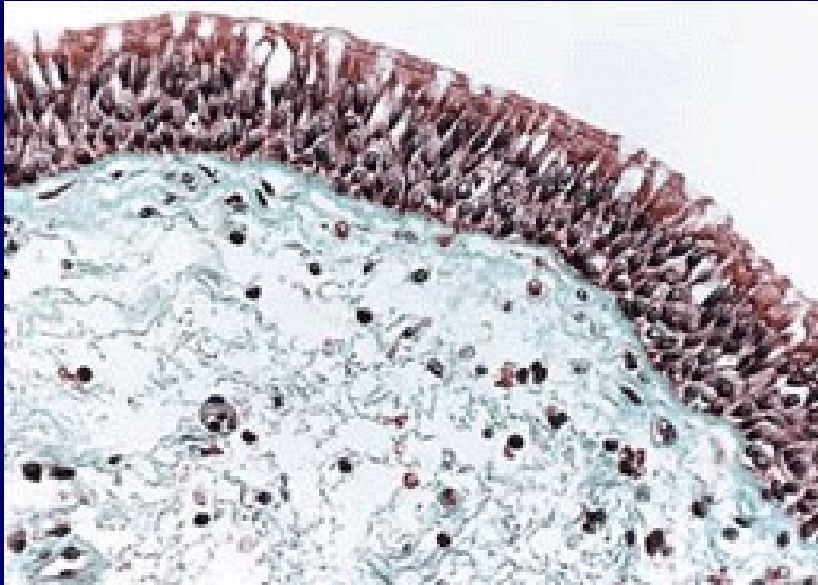


- ✓ Filtrazione aerodinamica
- ✓ Tosse e starnutazione
- ✓ Clearance mucociliare
- ✓ IgA secretorie

# Sistema Bronchiale



# *Epitelio Bronchiale*



# *Clearance Mucociliare*

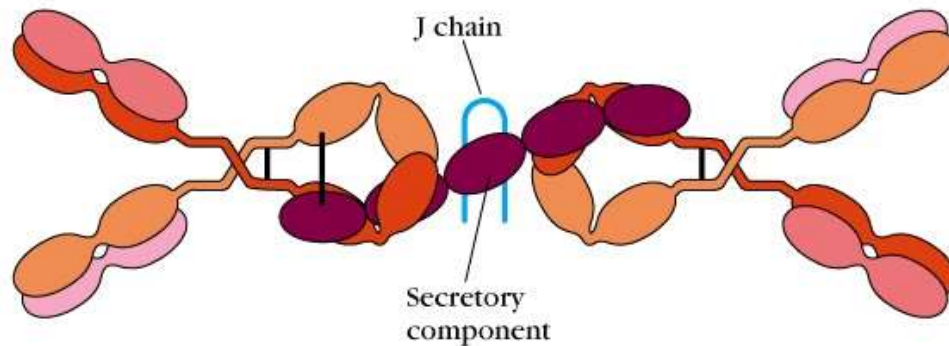


# Muco Bronchiale

- ✓ Bronchial secretions-lysozyme
  - ✓ NAMLAA (N-acetyl muramyl-L-alanine amidase)
  - ✓  $\beta$ -defensin (e.g. hBD-1, hBD-2)
  - ✓ Lactoferrin
  - ✓ Nitric oxide
  - ✓ Mucins have no direct anti-microbial effect but act as barrier and segregator of particles (mucins are upregulated by TNF- $\alpha$ )
- 
- ✓ Complement Fractions
  - ✓ Alpha-1 AT, alpha-2 M
  - ✓ Interferon
  - ✓ Proteynase, Metalloproteinase
  - ✓ Immunoglobulins (IgG, IgM, momeric IgA)

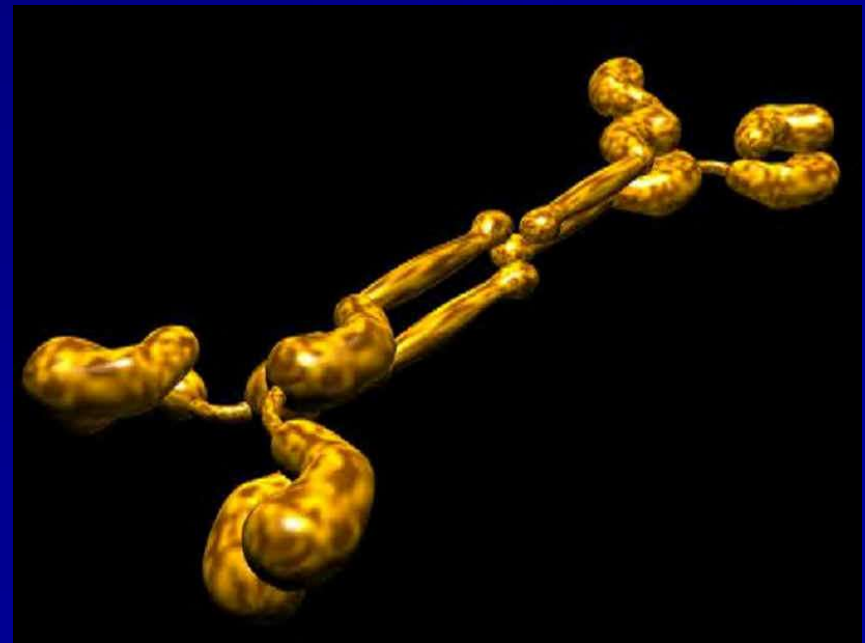
# IgA Secretorie

(a) Structure of secretory IgA

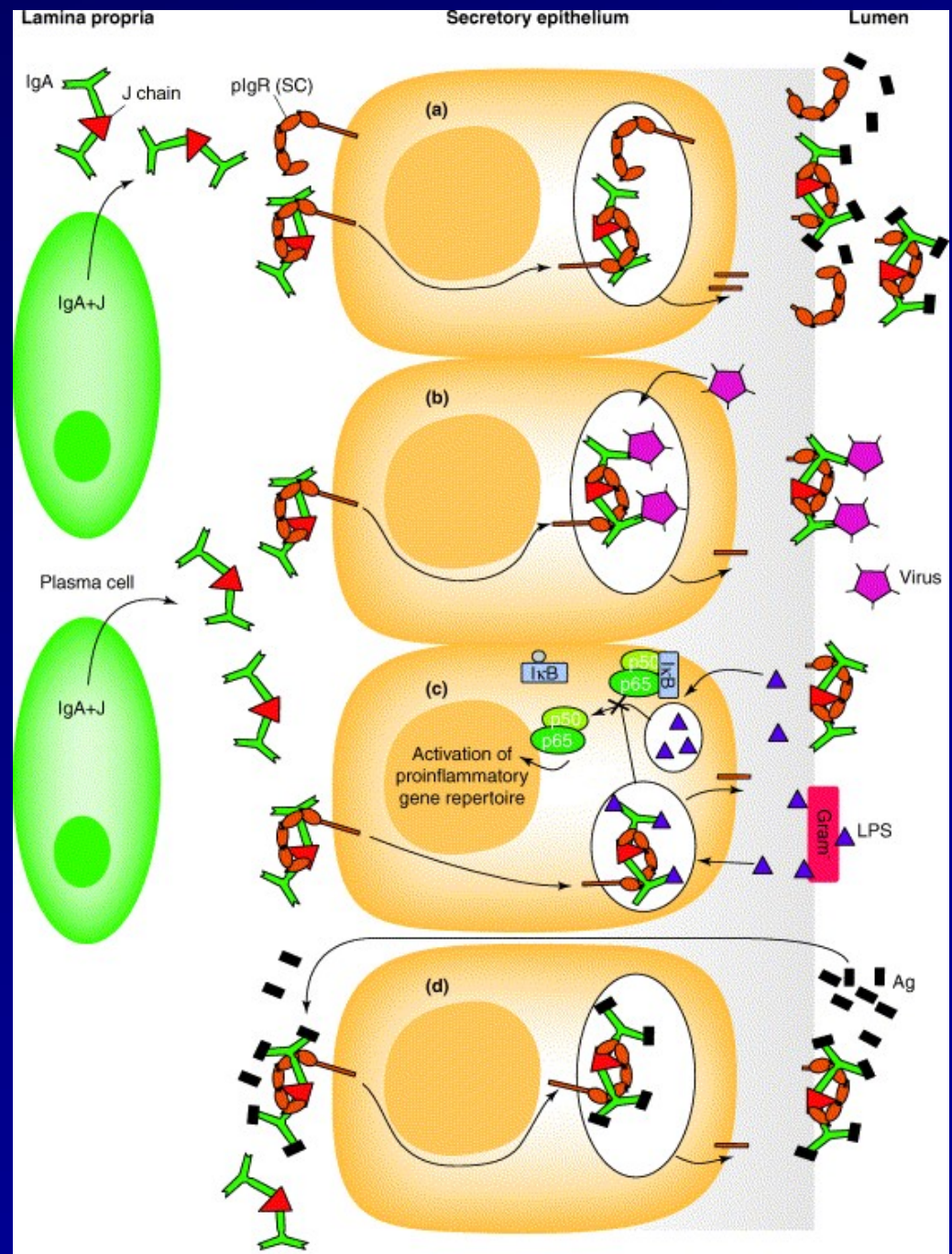


## Function

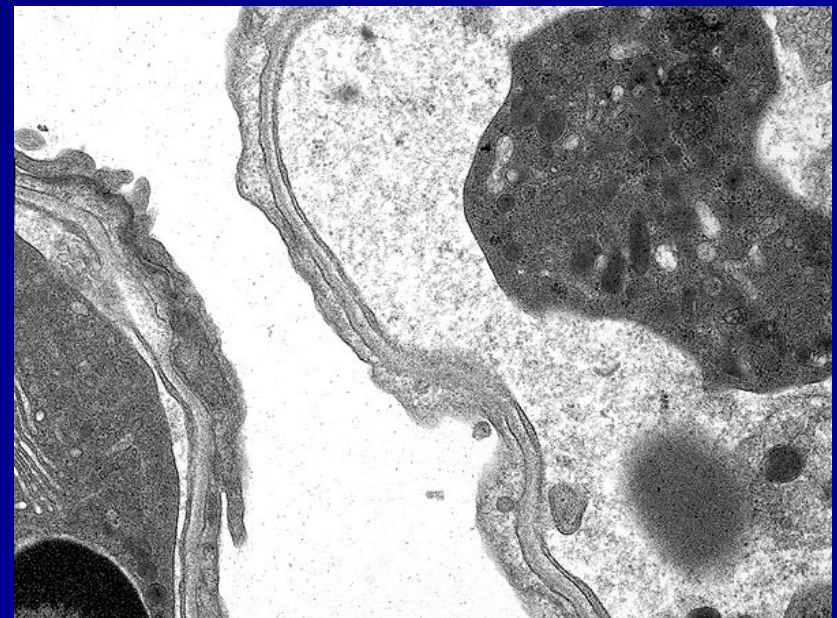
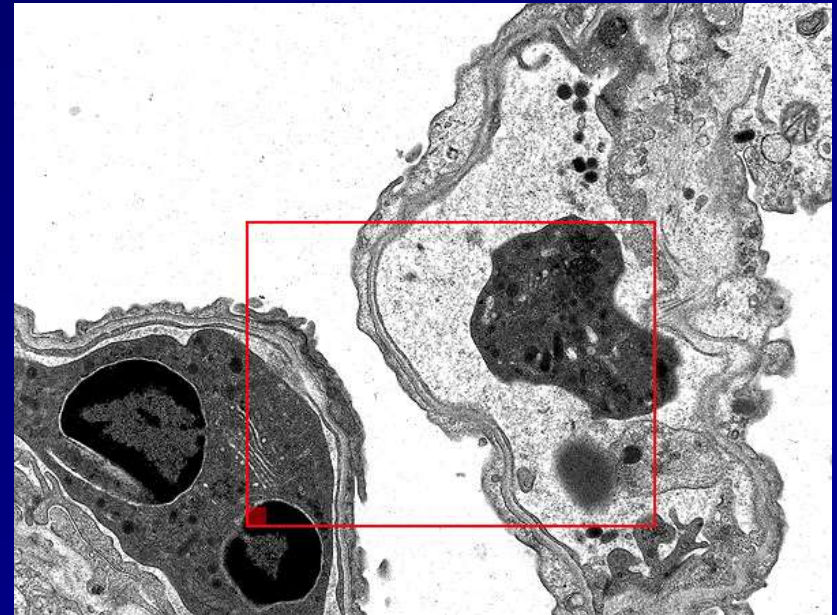
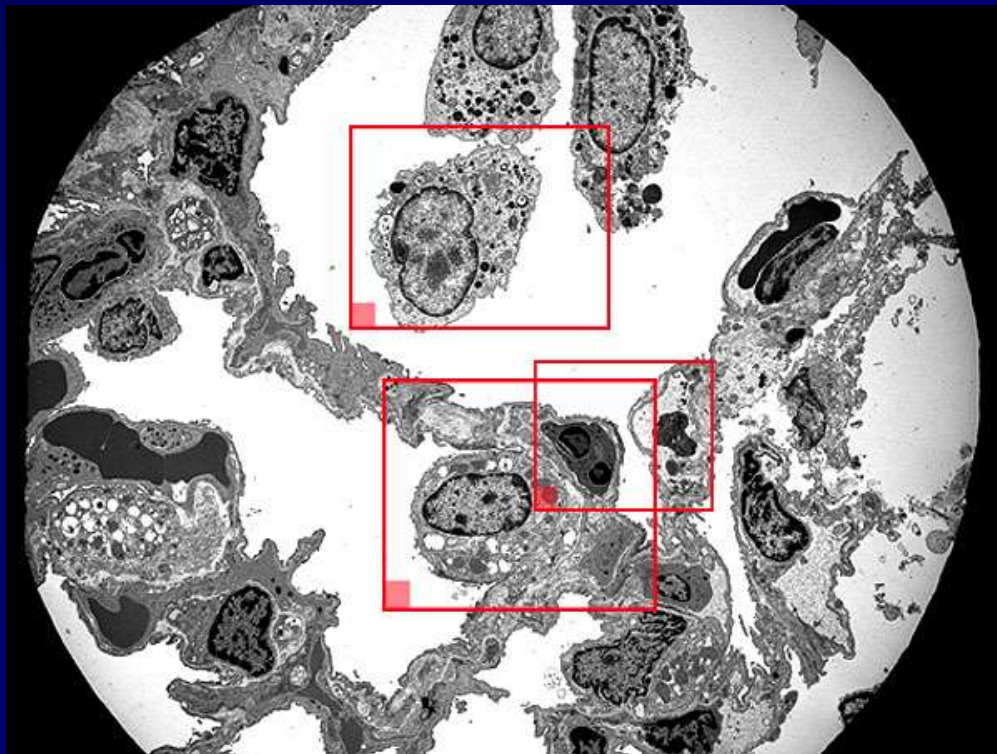
- ✓ Immune exclusion: forming a first line of defence where sIgA reduces the uptake of airborne molecules, bacterial toxins and other macro molecules.
- ✓ Anti-inflammatory
- ✓ Viral neutralisation
- ✓ Plasmid elimination
- ✓ Inhibition of pathogenic colonisation

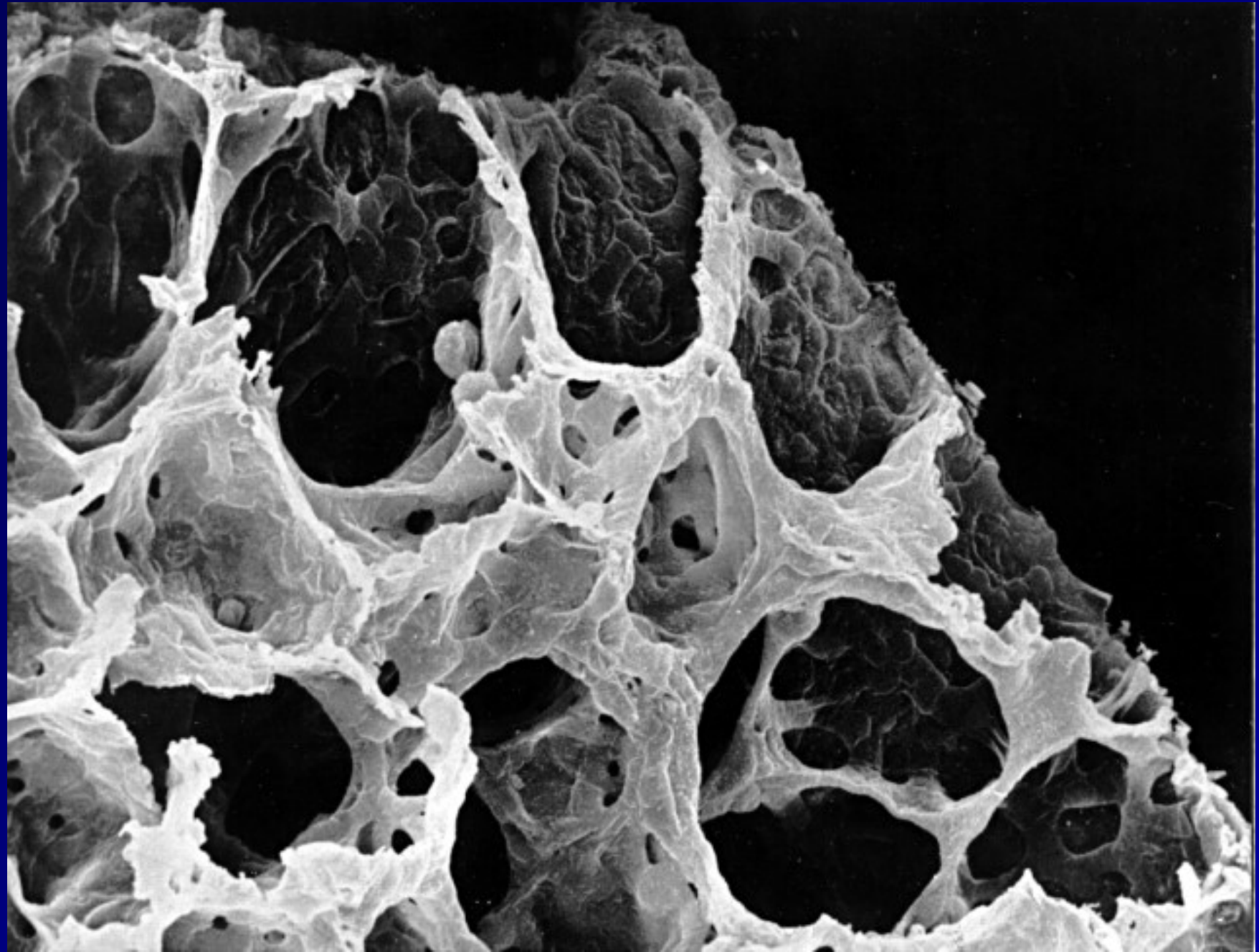


# *IgA Secretorie*

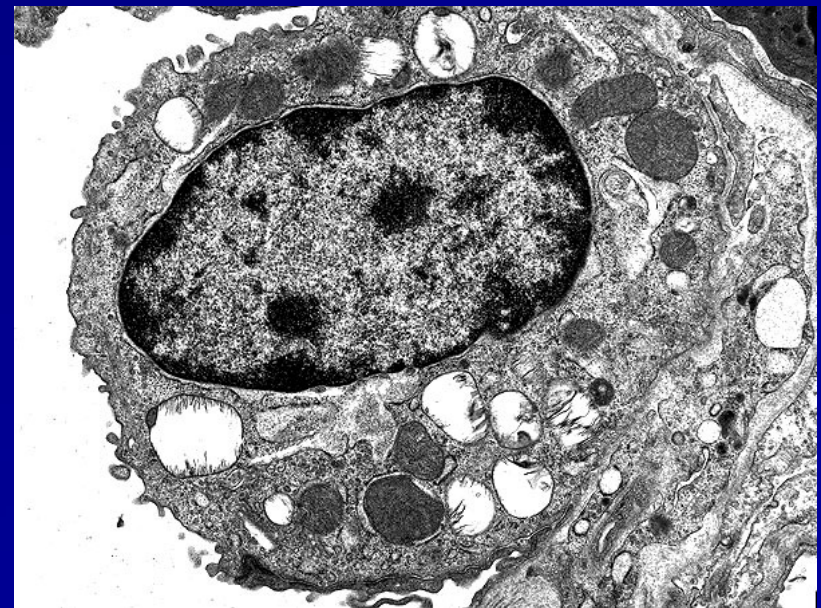
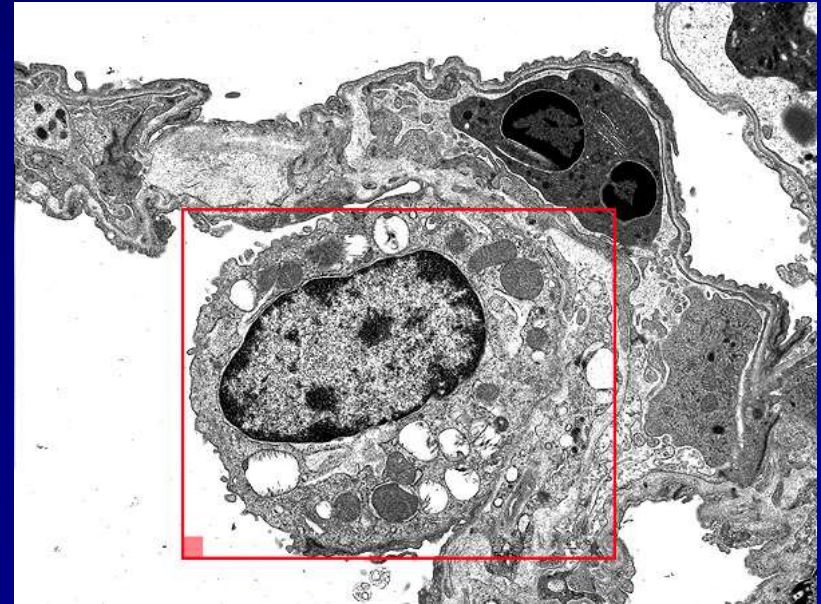
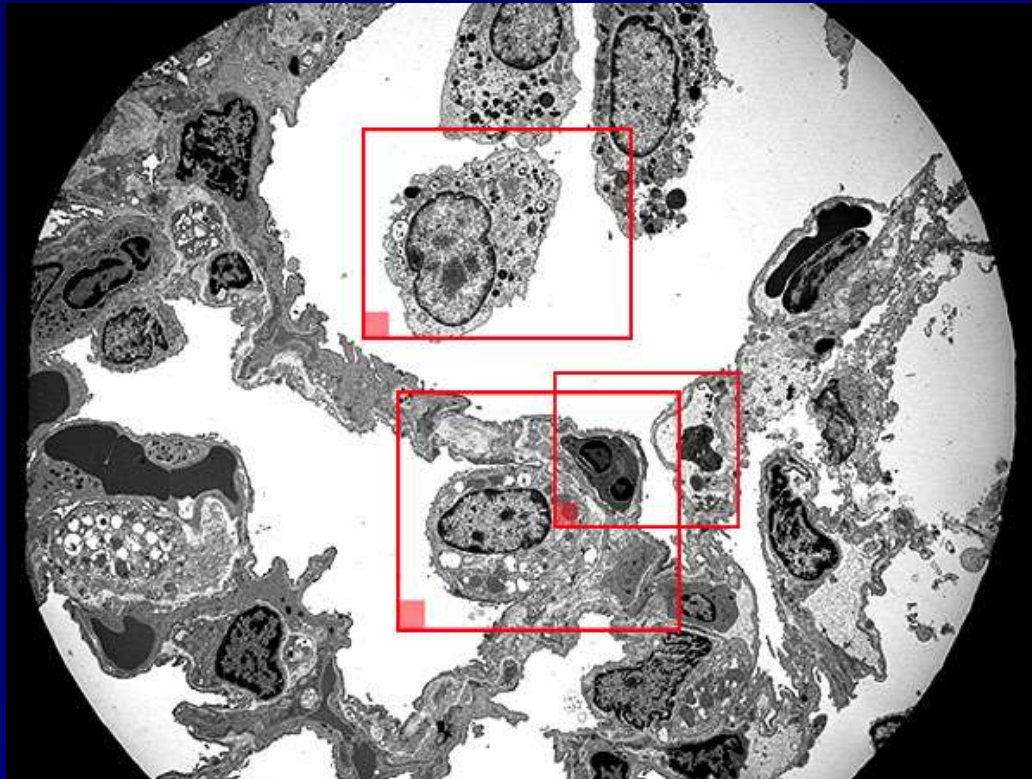


# *Vie Aeree Distali*



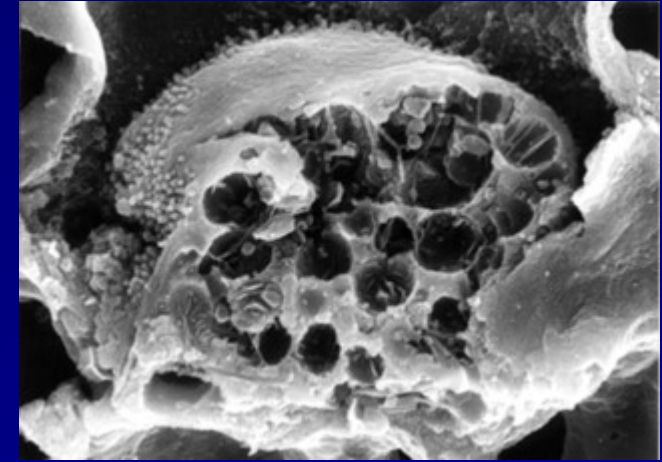


# *Pneumociti di II Tipo*

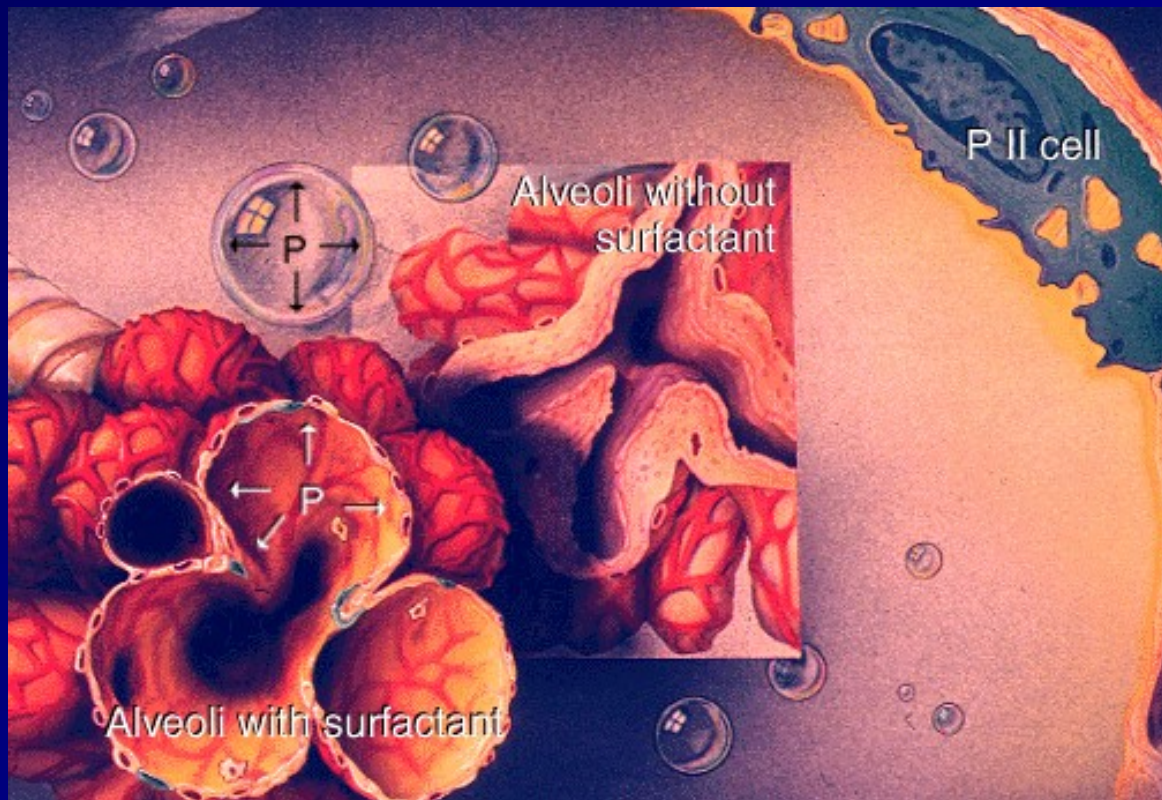


# Pulmonary Surfactant

- ✓ The lung surfactant reduces surface tension

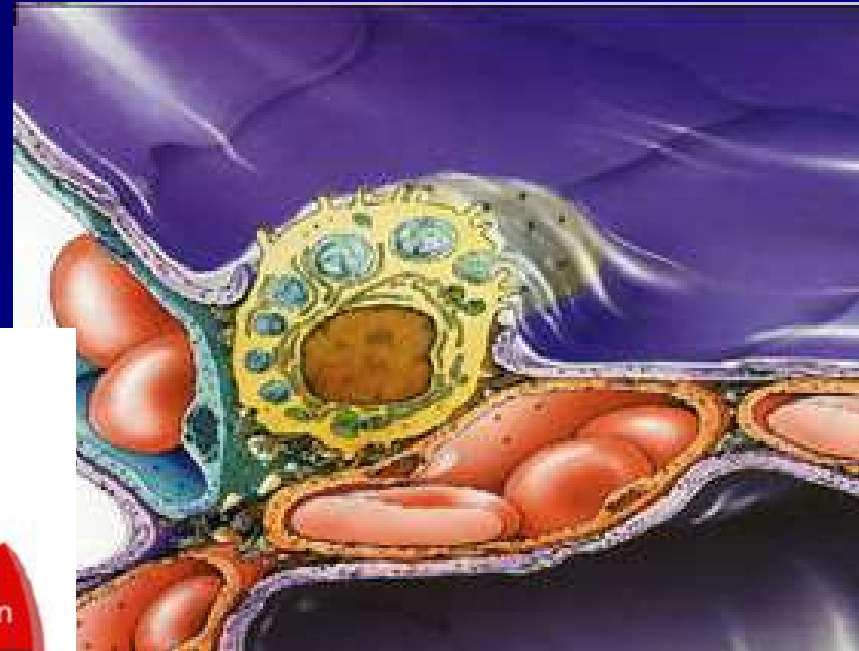


Type II Pneumocyte

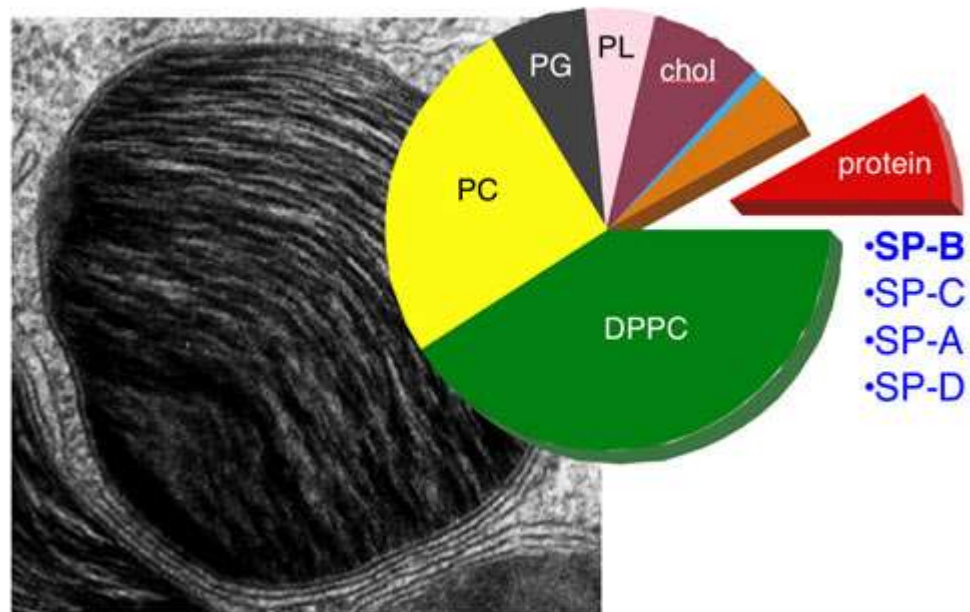


# Pulmonary Surfactant

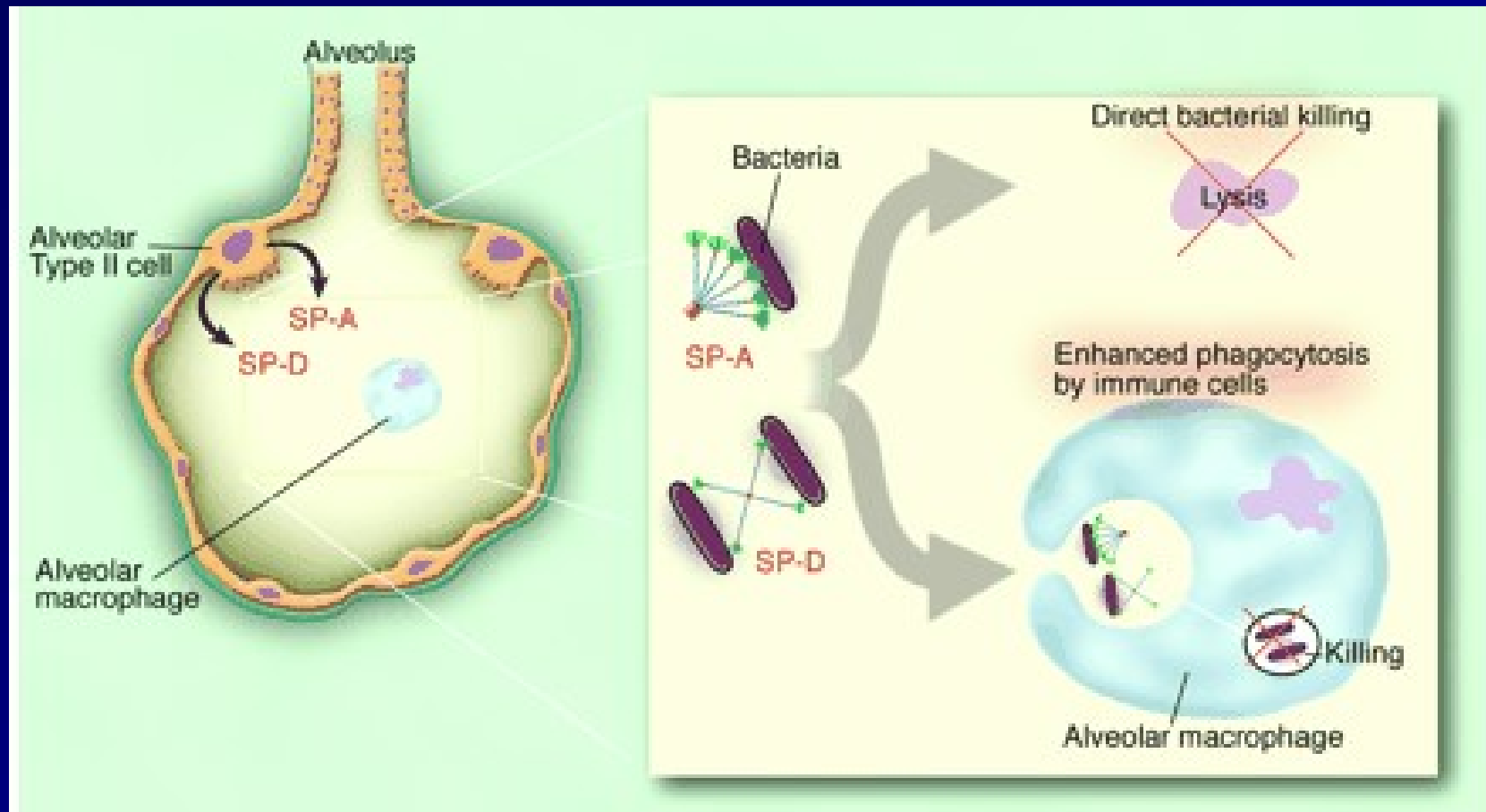
- ✓ The lung surfactant plays also a role in host defense



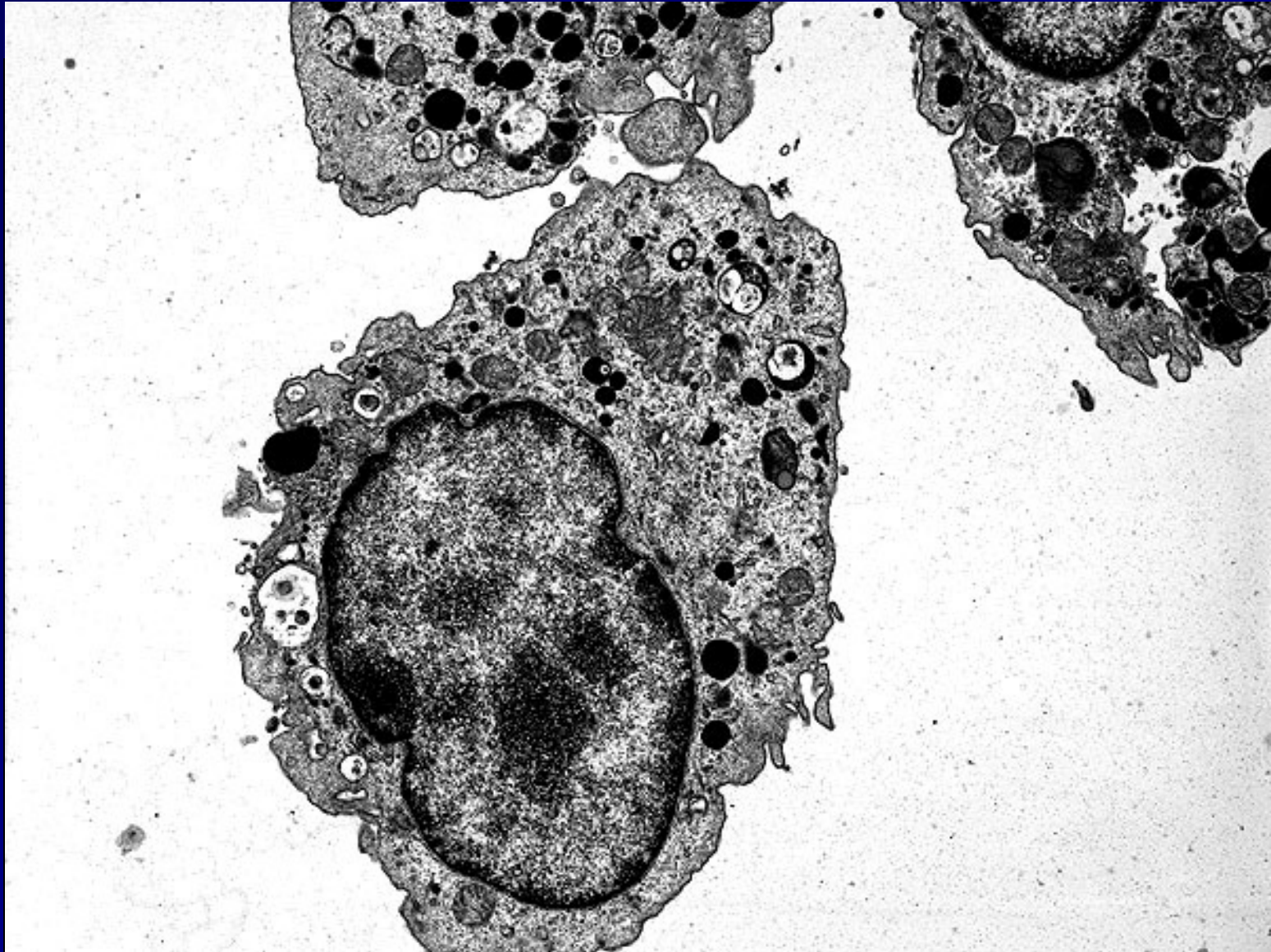
Surfactant Composition



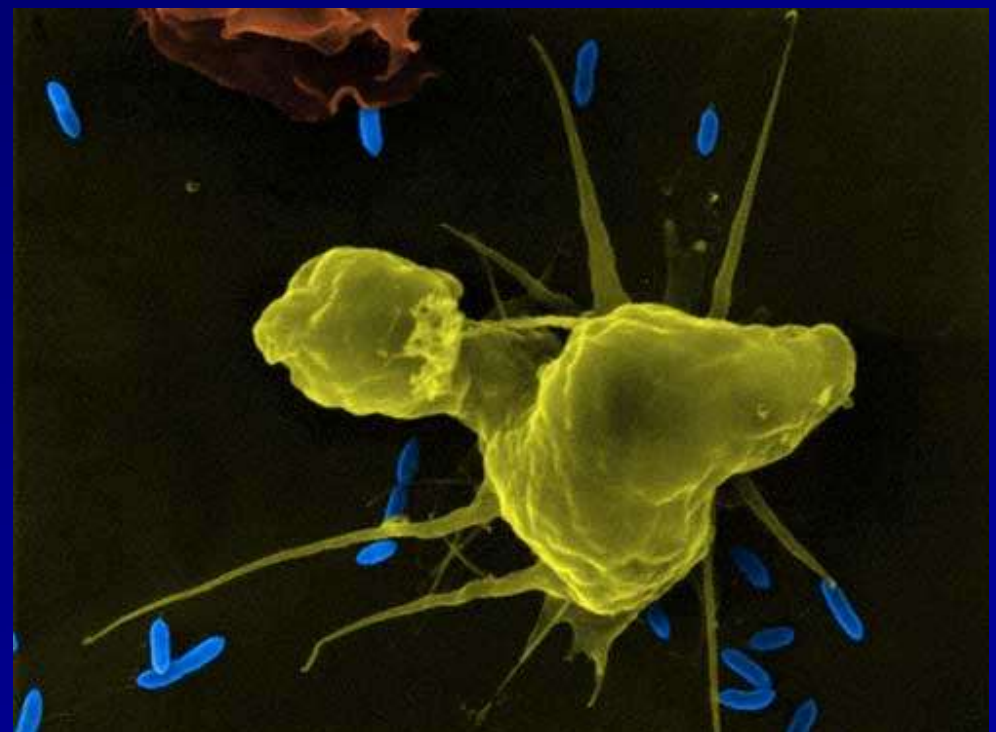
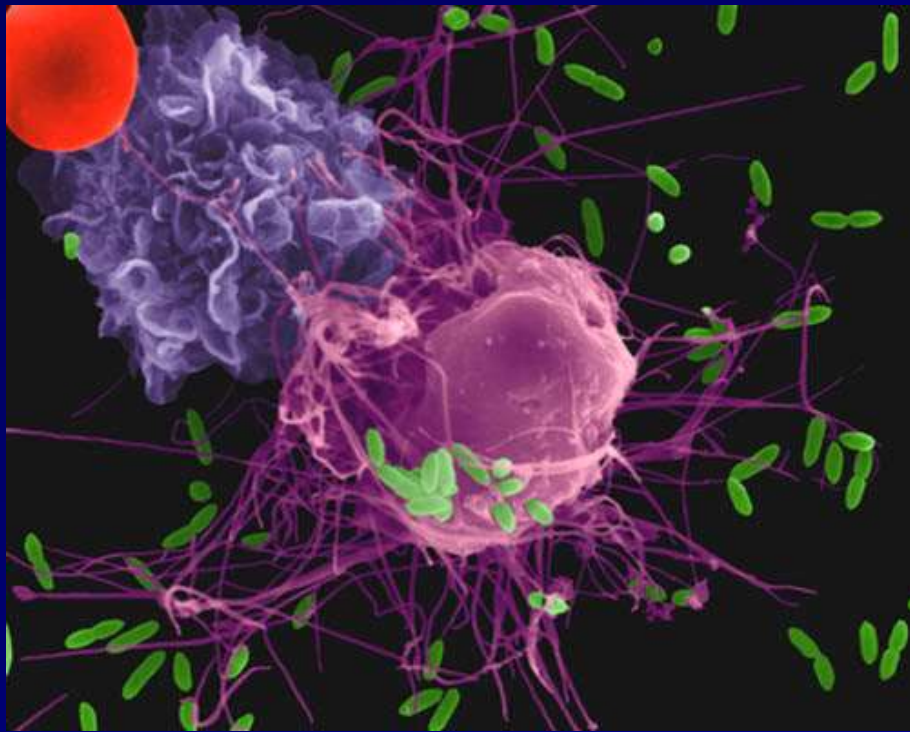
# *Pulmonary Surfactant: a front line of lung host defense*

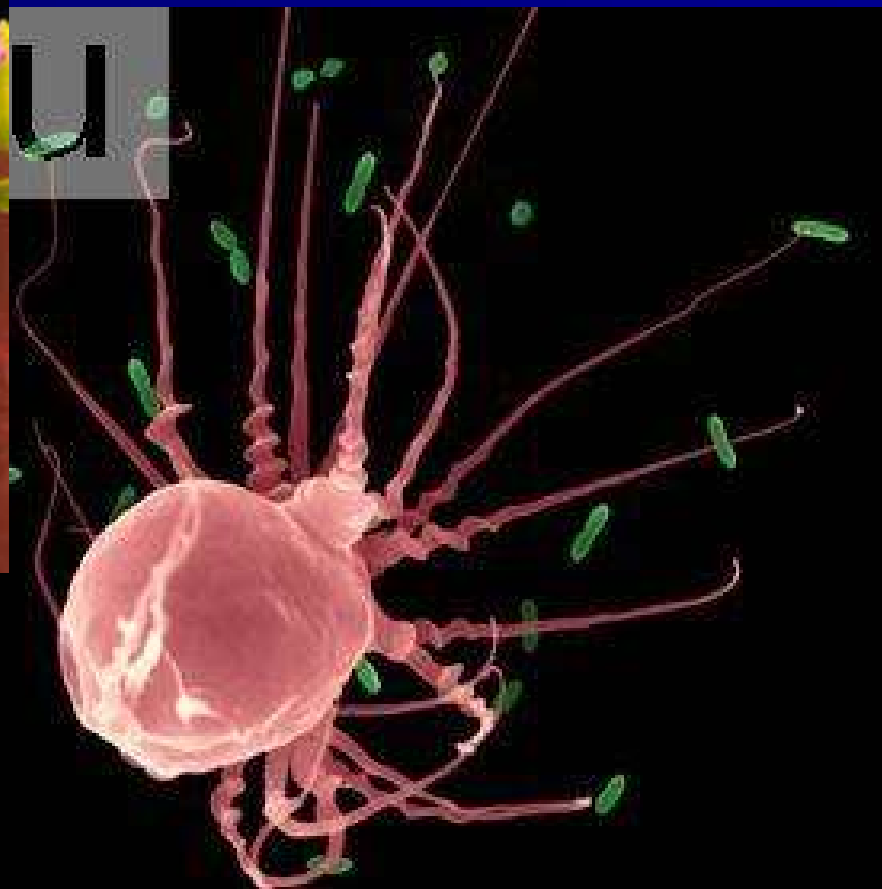
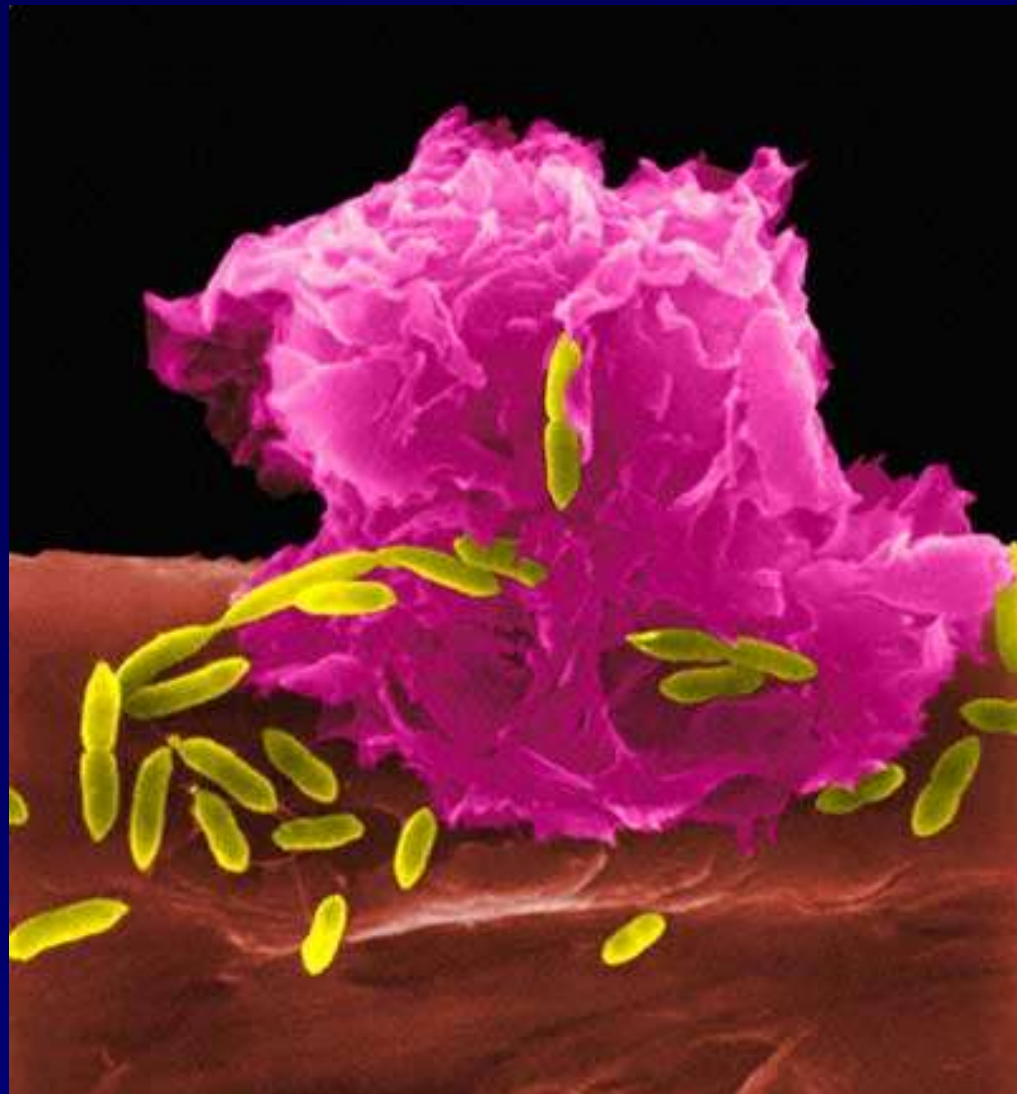


# *Macrofago Alveolare*

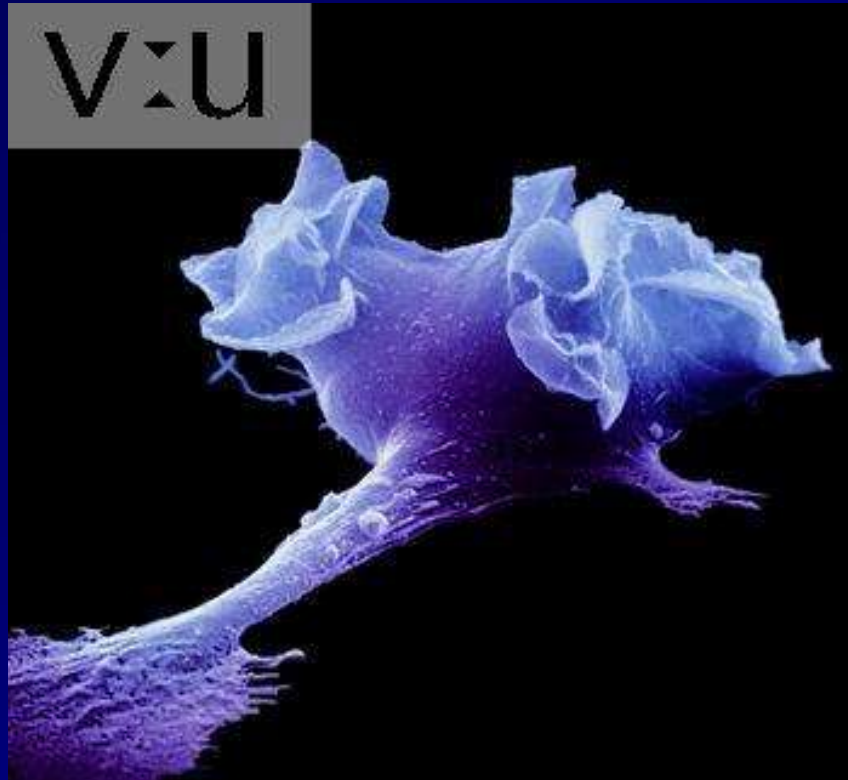


# *Macrofago Alveolare*





# *Macrofago Alveolare*



# *Macrofago Alveolare* *Fagocitosi*



# *Macrofago Alveolare*

## *Altre Funzioni*

- ✓ Attività microbica
- ✓ Processazione e presentazione antigenica
- ✓ Attività antitumorale
- ✓ Infiammazione
- ✓ Remodeling tissutale

# *Neutrofili Polmonari*



