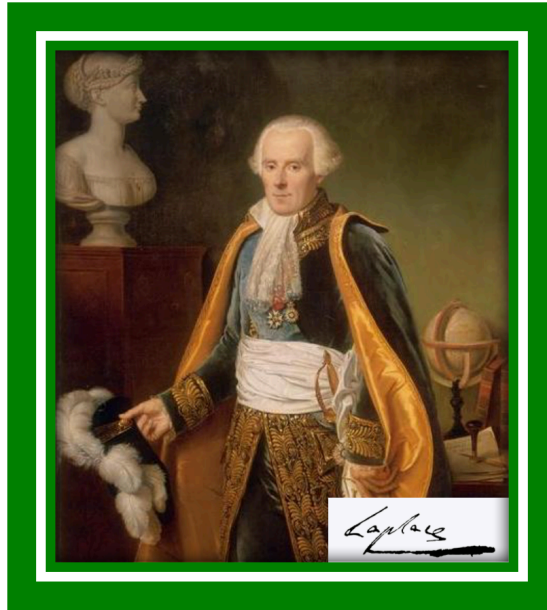
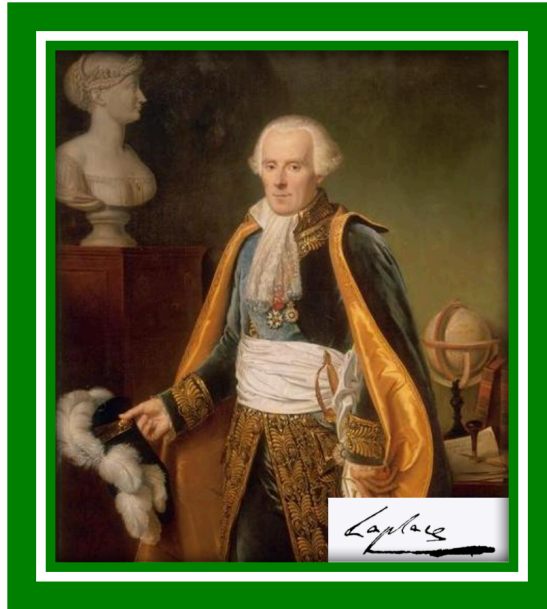


Podcast (Video Recorded Lecture Series):
Surfactant for the USMLE Step One Exam



Howard J. Sachs, MD
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Tutorial Services
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Surfactant Must Knows

1. Cell Type
2. Composition
3. How Law of Laplace applies?
4. Mechanism of Benefit
5. Diseases Associated with Deficiency
 - (and Pathologic Description)
6. Key Ratio
7. Tricks to increase prenatal level?

Surfactant Must Knows

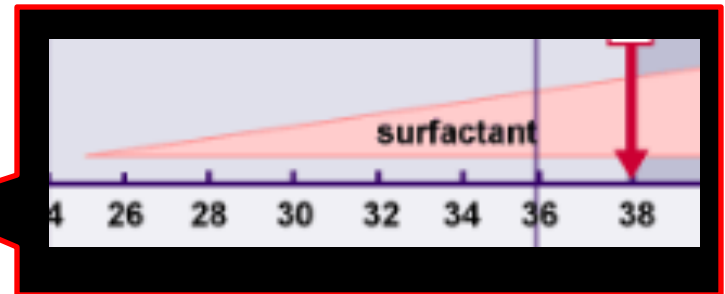
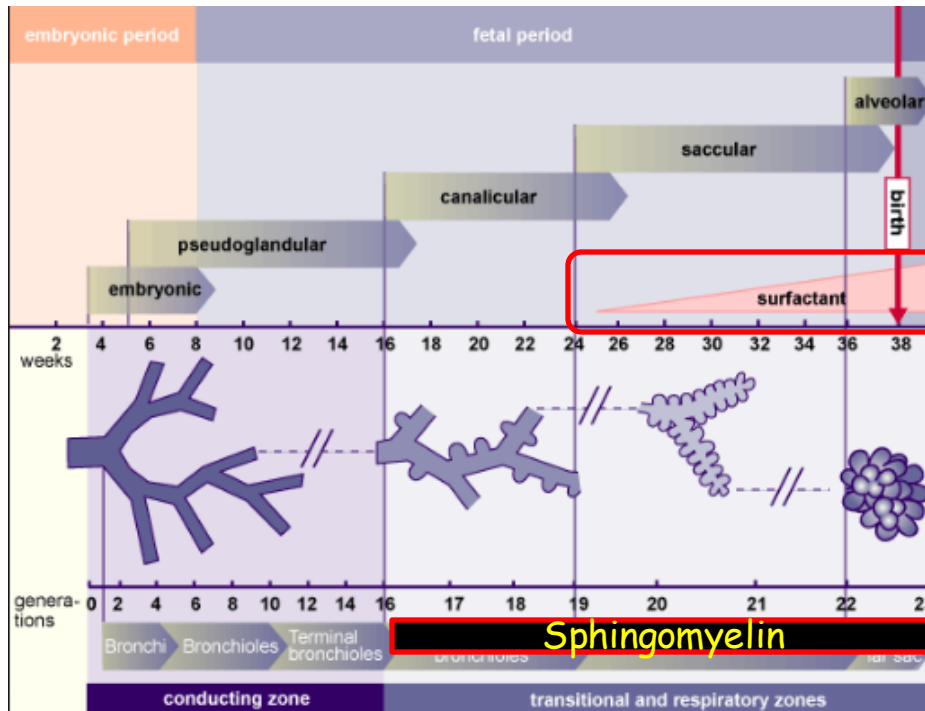


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Surfactant Facts:

- **Synthesized by Type II pneumocytes**
 - Primarily Dipalmitoyl Phosphatidylcholine (DPPC)
- **Maturity present by week 35 gestation**
 - Lecithin: Sphingomyelin Ratio of 2:1 indicates lung maturity.
 - **Sphingomyelin** remains stable; **Lecithin** production increases

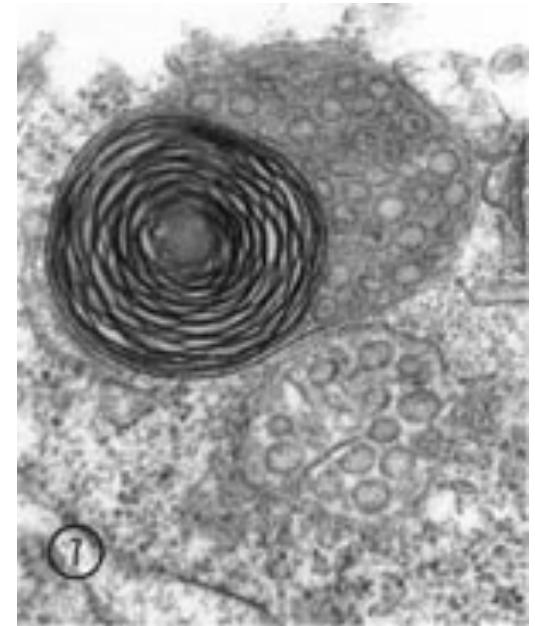


Weeks 24-34 =
Lung Immaturity

got steroids?

Surfactant Facts:

- Synthesized by Type II pneumocytes
 - Primarily Dipalmitoyl Phosphatidylcholine (DPPC)
- Present by week 35 gestation
 - Lecithin:Sphingomyelin Ratio of 2:1 indicates lung maturity.
 - Sphingomyelin remains stable; Lecithin production increases
- **EM: Lamellar Body**
 - 'Organelles containing parallel stacks that unravel'
- Production:
 - Increased with CCS/thyroxine (i.e. stress hormones)
 - Decreased with insulin (i.e. diabetic mothers)
- **Role:** ↓ Surface tension of alveolus



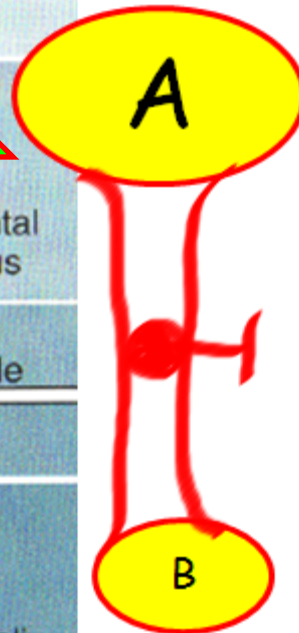
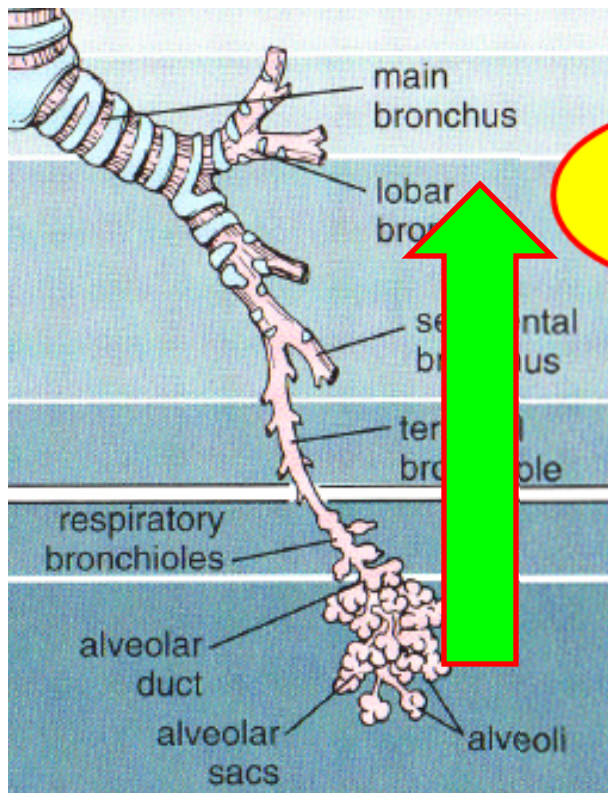
Do babies of diabetic mothers have a higher incidence of RDS?

Yes, owing to prematurity.

Surface Tension is defined by Laplace Law

$$P = 2T/r$$

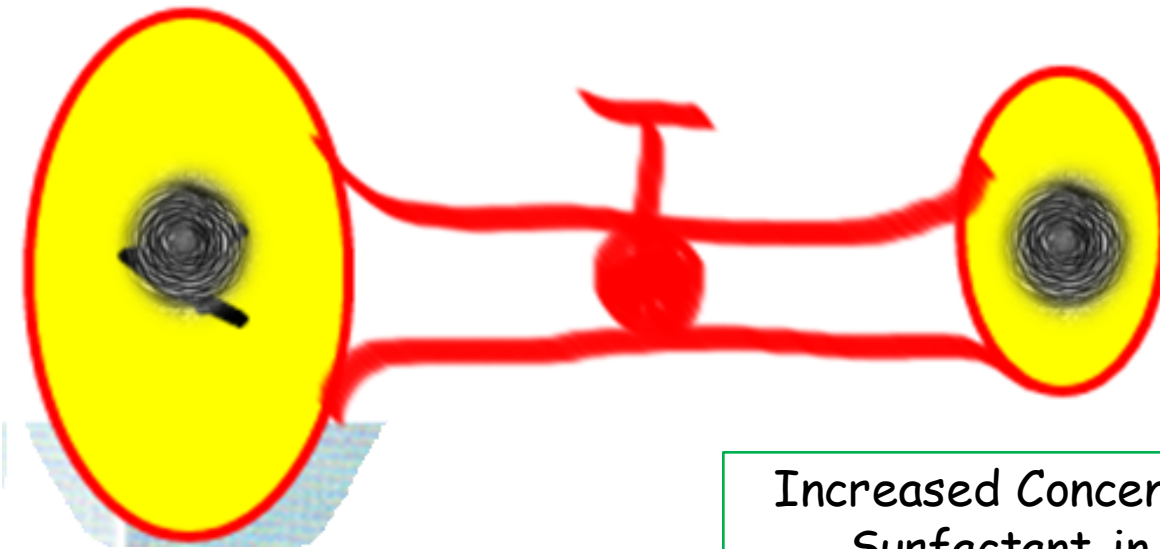
P is the **collapsing pressure**



Based on the law,
and the radius in particular,
which is more apt collapse:

A Large Airway
B Tiny Alveolus

Unraveling Lamellar Bodies

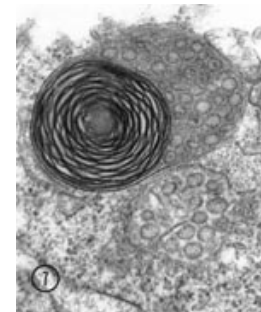
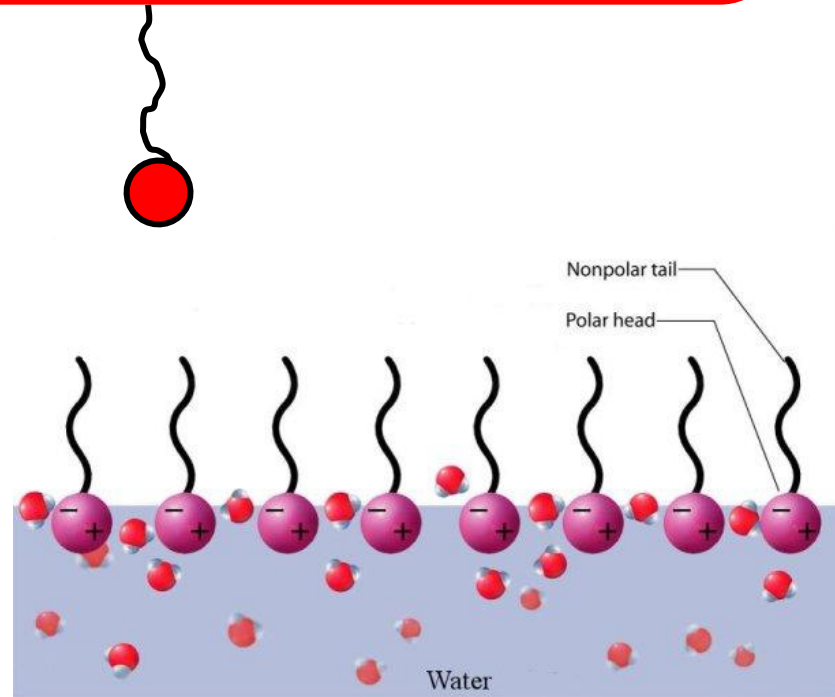
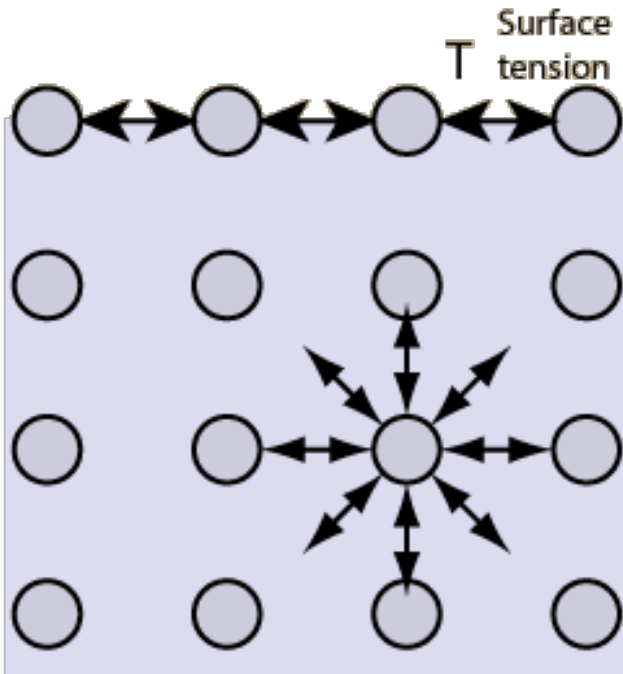


Increased Concentration of
Surfactant in Alveoli
(covers larger surface area)

Surface Tension is defined by Laplace Law

$$P = 2T/r$$

P is the collapsing pressure



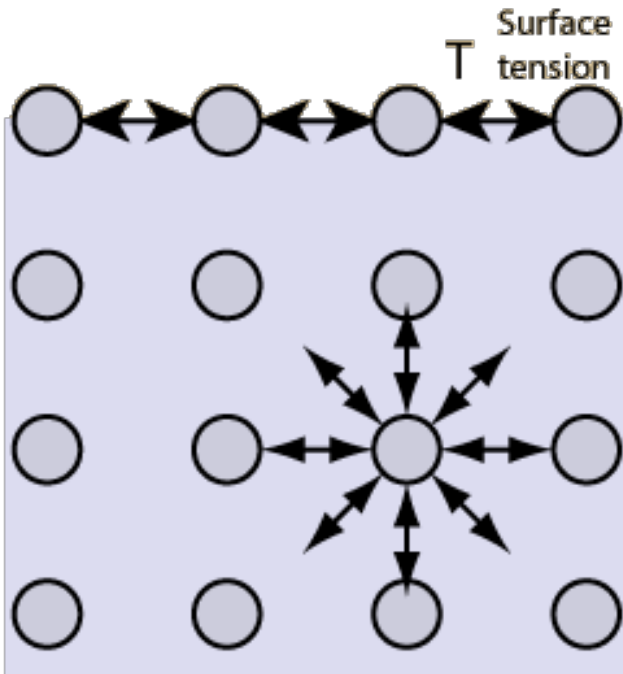
Surface tension is created by cohesive interactions between water molecules

So what does surfactant do?

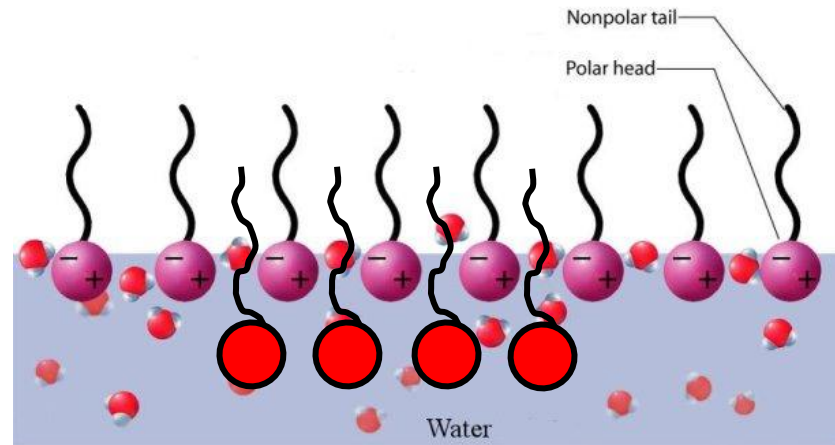
Surface Tension is defined by Laplace Law

$$P = 2T/r$$

P is the collapsing pressure



Surfactant: decreases surface tension
(and therefore collapsing pressure)



Alveolar collapse is called **atelectasis**
(Gk: atel - incomplete; ectasis - extension)

Surfactant Must Knows

1. Cell Type: Type II PC
2. Composition: DPPC (phospholipid)
3. Law of Laplace: $P = 2T/r$
4. Mechanism of Benefit: ↓ hydrophilic interaction
5. Diseases Associated with Deficiency : RDS, **Atelectasis** (V-Q mismatch; physiologic shunt)
 - Pathologic description: hyaline membranes (**fibrin, proteinaceous exudate & cellular debris**)
6. Key Ratio: 2:1 (Lecithin:SM)
7. Tricks to increase prenatal level: Steroids

Surfactant Must Knows

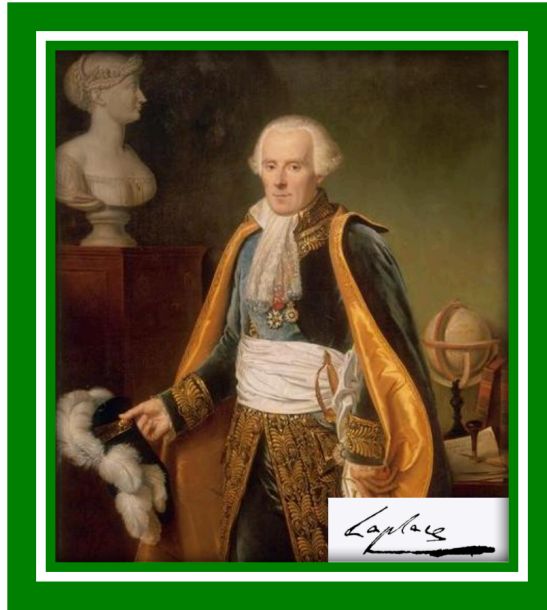
Thank you

1. Cell Type: Type I
2. Composition
3. Law of Laplace
4. Mechanism of
5. Diseases Associated with
mismatch; pulmonary
• Pathological
exudate
6. Key Ratio: 2:1
7. Tricks to inc



(V-Q
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