

Irremovable blood stain in lung: air-to-interface transport of albumin and its response to multiple compression/expansion cycles

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It is known that the serum albumin in the blood inhibits the lung surfactant and leads to respiratory failure. However, it was never investigated before that what happen if albumin in the blood flow directly to the alveoli surface through the airway, not from the aqueous alveolar fluid. To study this situation, air-to-interface transport of the serum albumin to the phospholipid monolayer and compression/expansion cycles of the interface was done. When the droplet of albumin coalesces with lipid monolayer, the albumin leaves a petal-shaped stain at the interface, which is very stable. While the protein film formed at the surface pressure of 20 mN/m is compressed, its area continuously decreases maintaining its shape. From around 44 mN/m, it begins to collapse from its arms, means that the film can no longer sustain the compressional stress. Finally, it leaves the skeleton of compressed albumin layer above 60 mN/m, and the folded albumin film does not completely re-expand even at the zero surface pressure. Considering the diameter of the alveoli is about 50 to 100 μm , they are hard to be recovered even with small amount of bleeding.