Interfacial tensiometry of tracheal aspirates from children with neonatal respiratory distress syndrome

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The lung alveolar surfactant (AS) is a complex lipid-protein mixture, essential for the normal respiratory activity. The main AS function in vivo is to reduce the alveolar surface tension (γ, mN/m) and to provide alveolar stability. The absence of a “mature” AS in the lungs is the main reason for the development of neonatal respiratory distress syndrome (NRDS) that often has lethal outcome. The modern RDS therapy includes the use of different native or synthetic exogenous surfactants (ES), which should replace the normal human AS. In order to determine the infants’ lung maturity and the necessity of surfactant therapy it is of great importance to study the composition and the functions of the alveolar surfactant, derived with invasive techniques.

The aim of the present study was to assess and to compare the maturity of tracheal aspirates from children with untreated NRDS, and NRDS infants after therapy with the exogenous surfactant Curosurf. For control the pure Curosurf dispersion was also tested.

Curosurf is a naturally derived surfactant indicated for the treatment of RDS in premature infants. The product has been shown to reduce mortality and pneumothoraces associated with RDS. Shortly after administration, the surfactant rapidly coats the alveoli to stabilize against collapse. By reducing surface tension, Curosurf helps facilitate lung expansion and gas exchange in premature infants.

In this study biochemical and biophysical analyses of the clinical samples (before and after administration of Curosurf) were made. Lipid and protein concentrations in the samples were determined. Making use of the pending drop method, which requires a minimum volume of the solution studied, the surface characteristics were determined: equilibrium surface tension values, maximal and minimal surface tension values during 10 cycles of compression-decompression, as well as the shape of the hysteresis loop under dynamic conditions.

The results show that the children with untreated NRDS had low phospholipids content, high equilibrium, maximal and minimal γ values of the tracheal aspirates. In contrast, the clinical samples from children after surfactant therapy with Curosurf show a high concentration of phospholipids and low surface tension values, suggesting that the application of the exogenous surfactant improves the composition and properties of the pulmonary surfactant in the infants.

The results from our work could be useful for the clinical practice in the RDS therapy of children and adults.

Acknowledgement: This work was financially supported by the Bulgarian Ministry of Education, Youth and Science, project N D002-107/08.