EFFECTIVE DRUG DELIVERY TO THE RESPIRATORY PORTION OF THE LUNG USING SUBMICRON VATERITE PARTICLES

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Introduction
High level of mortality caused by lung diseases is the great problem of our time. Complexity in the development of new drugs for the treatment of pulmonary diseases makes researchers to seek for new delivery systems, which can provide biocompatibility, prolonging time of release and possibly therapeutic effect inherently. Also the lungs can be considered as alternative route for drug delivery into the system.

Results and Discussion
The calcium carbonate particles were examined as the delivery system because of their high biocompatibility. The particles of calcium carbonate (vaterite) of different size (3.15 um, 1.35 um, 0.65 um) marked by conjugate of BSA and Cy7 were injected into the lungs of mice through tracheostome at a dose of 0.6 mg (volume of 60 µl). Vaterite particles were dispersed in sodium chloride buffer 0.9% at the concentration of 10 mg/ml. The biodistribution of calcium carbonate particles was observed during 72 hours using luminescence approach (In Vivo Imaging System). After sacrificed of mice the lungs, livers, kidney, spleens, stomachs were dissected and the images of these organs luminescence were made. The SEM images of lung cryo-slices with instillation of 0.6 um calcium carbonate particles were obtained. Furthermore, laser scanning confocal microscopy shows 0.65 um particles reaching the alveolar space. The delivery of fluorophore to the blood was assessed using Cy7 labeled 0.65 um particles. The pharmacokinetics of NIR fluorescence dye will be shown.

Conclusions
These studies establish that by using 0.65 um particles loaded with Cy7 we can efficiently access the respiratory portion of the lung, which represents a potentially efficient delivery mechanism for both the lung and the vasculature.

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