

Inhale Therapeutic Technologies

ELE 282 Biomedical Engineering Seminar

University of Rhode Island

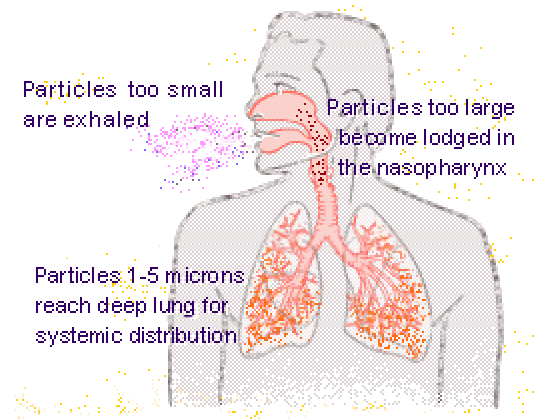
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The idea behind this technology is very simple: to come up with a non invasive way to deliver a drug quickly, efficiently, and with good results. Injections are painful and difficult to have to perform everyday. Oral techniques are not effective because the drug is digested before it reaches the blood stream. Nasal inhalers do not work because the molecules are too large to pass through the membranes. This leaves introduction through the pulmonary tract. This seems to be a very effective delivery method. "Research has shown that many molecules are absorbed through the deep lung into the bloodstream naturally with high drug absorption and without the need for enhancers used by other non-invasive routes. This high bioavailability makes the lung a natural target for peptides, proteins and small molecules that would benefit from pulmonary delivery. In addition, the lung itself is a robust organ. According to the American Conference of Governmental Industrial Hygienists, a person can inhale approximately 30 mg per day of nuisance dusts into the lung day after day for years in industrial settings without effect. Further, there is no evidence that inhaling autologous (self) proteins presents any immune response issues."

The way that the drug is introduced is very unique. It comes in a powdered form that was, from the sound of the process, very hard to achieve. There are a few problems with having the lung accept this drug "dusk." The

biggest one is the size of the molecules. For the drug to be effectively and efficiently absorbed, the molecule needs to be between 1 and 5 microns in size.



Other problems that arose were keeping the drugs completely dry and irradiating microbial growth. These problems were solved with blister packaging and other chemical techniques.

The delivery of the drug was the other "part of the equation" that needed to be solved. The hardest part was getting a consistent, regular dosage that was self administered by the patient. Because a patient's inspiratory pace may differ from time to time, the device had to work independently of this. A patient pulls a hand pump to compress a small charge of air; inserts a packet containing the drug powder into the slot in the front of the device, then presses the firing button to disperse the powder into an aerosol cloud. This technique has proved very reliable.