Summary:
The invention enables more efficient, reproducible, and convenient drug administration to ventilated patients.

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Overview:
Inhaled drug delivery is an alternative to oral drug administration that can provide both systemic and local drug delivery. Although inhaled drugs can provide drug treatment locally in the lung bed, the amount of drug that can reach the target is very low compared to the total amount of drug administration. The drug delivered is not only inadequate to treat disease, but increasing dose to compensate for this inefficiency can cause undesirable side effects. This issue is especially important in ventilated patients where drug aerosols must navigate ventilator and endotracheal tubing. In addition, common ventilator settings (humidity, flow rate, tidal volume, etc) are not compatible with current dry powder devices. Improvements are needed with regards to the devices and formulations for delivering dry powder aerosols to ventilated patients. To deposit in the lungs, drug particles should be in the size range of ~1-5 microns. Micronized particles may have undesirable performance because the large energy required to deaggregate the particles or due to poor aerosolization properties of the particles.

How it works:
To deliver drugs to patients on mechanical ventilation, the drug particles have to successfully navigate through an endotracheal tube and the ventilator tubing. Liquid formulations (e.g. nebulized) normally used with these patients are inefficient. Large amounts of drugs are deposited in the endotracheal tube and within the ventilator circuit. Dry powders offer an alternative formulation to enhance drug delivery to the patients. Inhaled dry powder drugs are delivered via dry powder inhalers (DPIs). DPIs are not designed to connect with mechanical ventilation. We have designed DPIs that can be connected directly to the endotracheal tube to provide convenient drug delivery to intubated patients. We have also identified the necessary attributes of dry powder formulations to achieve efficient and reproducible dosing through endotracheal tubes or through catheter tubing designed to bypass the variable endotracheal tube environment. Both the inhaler design and dry powder formulation properties were found to be significant components for effective drug delivery to intubated patients.

Why it is better:
Overall, improvements in drug delivery efficiency, dose reproducibility, treatment options, and physician convenience are possible along with the typical dry powder inhaler benefits of excellent stability and high dose loading.

Patents:
Patents Pending.

Additional Web Content:
Contact the inventor, Cory Berkland.