Background and Aims Helium-oxygen gas mixture (heliox) has been utilized for ventilatory support of infants with respiratory failure. Therapies which potentially could improve aerosol delivery to ventilated infants are needed. The aim of the study was to assess heliox utilization in delivery of aerosolized albuterol sulfate to a model of ventilated newborn.

Methods A neonatal system was assembled utilizing an Avea ventilator, test lung and vibrating mesh nebulizer Aeroneb placed within inspiratory arm of the ventilator circuit. Pressure controlled mode (SIMV) was used with a rate of 40 bpm, IT of 0.35s and inspiratory pressures of 20 cmH₂O with two different ET tubes: 3.0 and 2.0. The study was conducted with heliox and air-oxygen gas mixtures at FiO₂=0.21. Albuterol sulfate (0.25 mg/mL) was aerosolized and captured on HME low volume filter located at the end of the ET tube and upstream from the test lung. Emitted dose of the nebulizer was determined by exposing 3 filters to the aerosolized albuterol at the ‘Y’ and end of the ET tube. Filters were collected, extracted and albuterol quantified using high performance liquid chromatography.

Results No significant difference between heliox and air-oxygen was found in albuterol sulfate delivery at the Y-connector and ET tube 3.0. For smaller tube heliox was inferior to air (p<0.05).

Conclusions Due to its lower density, heliox flow rate at a given driving pressure will be higher than the air-oxygen flow rate. Increased inspiratory flow rate in a patient ventilated using artificial airway may not be beneficial for aerosol delivery. Differences in flow rates between heliox and air-oxygen in the study might have outweighed the previously reported beneficial effects of heliox on aerosol delivery.

Conclusion Many variables impact DS and airway resistance during ventilation some of which maybe important for preterm newborn.