

TEST I: Rate of albuterol sulfate aerosol formation (Nebulization rate)

Purpose: To determine the rate of albuterol sulfate aerosol formation

Set-up: Nebulizer reservoir connected to CPAP. Residual volume of reservoir is full.

Experimental procedure:

- Add 6 mL of solution to nebulizer medication reservoir according to albuterol dilution chart below.
- Start a timer and simultaneously turn on nebulizer power to run on high and turn on CPAP to 5 mmH₂O.
- Run CPAP and nebulizer continuously until all medication is gone and record time in chart below.
- Calculate nebulization rate.
- Repeat for at least 3 trials.

Results:

Albuterol Dilution	Time to nebulize 6 mL				Nebulization Rate (Total Vol/t)			
	Trial 1	Trial 2	Trial 3	Mean	Trial 1	Trial 2	Trial 3	Mean
6 mL albuterol								
5 mL albuterol, 1 mL water								
4 mL albuterol, 2 mL water								
3 mL albuterol, 3 mL water								
2 mL albuterol, 4 mL water								
1 mL albuterol, 5 mL water								
6 mL DI water								

Calculations:

Using the mean data, the nebulization rate of albuterol is calculated from the overall nebulization rate by dividing the volume of albuterol in the sample (as opposed to total volume) by the time to nebulize.

Albuterol Dilution	Vol. albuterol in sample	Time to nebulize 6 mL	Nebulization rate of albuterol
6 mL albuterol	6 mL albuterol		
5 mL albuterol, 1 mL water	5 mL albuterol		
4 mL albuterol, 2 mL water	4 mL albuterol		
3 mL albuterol, 3 mL water	3 mL albuterol		
2 mL albuterol, 4 mL water	2 mL albuterol		
1 mL albuterol, 5 mL water	1 mL albuterol		
6 mL DI water	0 mL		

Calculations:

1) Using mean data, plot Vol. vs. Conc.

2) The efficiency of albuterol delivery is calculated by dividing the amount of albuterol delivered in the allotted time to the mask by the amount of albuterol aerosolized over that time.

$$\text{Efficiency} = 100\% * [(\text{Vol}_4)(\text{Conc}_4)]/[(\text{Nebulization rate of albuterol})(\text{time})]$$

Albuterol Dilution	Vol₄	Conc₄	Rate	Time	Efficiency
6 mL albuterol					
4 mL albuterol, 2 mL water					
3 mL albuterol, 3 mL water					