

Nebulized Sodium Bicarbonate Solution as a Mucolytic Alternative Treatment for Cystic Fibrosis [†]

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Abstract: Cystic fibrosis is a genetic disease caused by a malfunction of chloride channels. This dysfunction produces dehydration of respiratory system mucus layers, leading to sticky mucus consistency that difficult ciliary clearance. Inhalation administration of sodium bicarbonate (SB) as a nebulization could make mucous secretions thinner and re-establish the pH of the pulmonary fluid. However, no SB commercial formulations are available, and there is no information regarding optimal mucolytic concentration, stability, and aerosolization behavior. This work aimed to study the stability, mucolytic and aerodynamic properties of SB solutions. For that, SB was dissolved at 4 and 8% (w/v) in saline solution. The resulting pH was around 8, a value well tolerated by respiratory mucosa, and did not change over time. The mucolytic activity was evaluated by determining the viscosity of mucin solutions with and without SB. The viscosity of mucin with SB showed lower significant values than pure mucin. Aerodynamic properties of the 8% (w/v) SB solution were determined using a jet nebulizer and a cascade impactor. The mass median aerodynamic diameter was around 3.17 μm , adequate for inhalation treatments; the aerodynamic distribution was also narrow. In conclusion, SB solutions demonstrated stability, and mucolytic and aerodynamic properties adequate for the proposed application.

Keywords: sodium bicarbonate; mucolytic; stability; aerodynamic properties.

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Conflicts of Interest

The authors declare no conflict of interest.