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Thesis Abstract (1994)

EFFECT OF SALT SELECTION AND ENVIRONMENTAL CONDITIONS ON DRY POWDER AEROSOL GENERATION

Three salts and the free base form of micronized albuterol, with similar particle size distributions and varying solubilities, were generated and studied as aerosols from a model dry powder inhaler (DPI) using a twin stage impinger (TSI) under varying environmental conditions. Albuterol adipate diethanolate (AAD) and albuterol stearate (AST) were prepared and characterized along with albuterol (ALB) and albuterol sulfate (ASUL). The model DPI was loaded with pure micronized drug in its various forms and inserted into the TSI following pre-equilibration at 20, 30 or 45°C and 30 through 95% relative humidity (RH). After a further 3 minute re-equilibration period, drug was aerosolized by withdrawing air through the DPI at 60 L/min for 20 seconds. Washings from the DPI and TSI were analyzed by UV spectroscopy. Drug collected in stage 2 of the TSI was expressed as fine particle dose (FD) or fine particle percent of either the loaded dose (FP_{loaded}) or the amount emitted from the DPI mouthpiece (FP_{emitted}).

Thermal analysis showed that ALB, AAD and AST melted at 158, 182 and 116°C, respectively. ASUL decomposed at approximately 200°C. At 22°C, apparent solubilities in deionized water of ALB, ASUL, AAD and AST were 15.7, 250, 353 and 0.6 mg ml⁻¹ respectively. Using a validated rotating disk dissolution apparatus at 120 rpm, intrinsic dissolution rates of ALB, ASUL and AAD in pH 7.4 phosphate buffer at 37°C were 1.1, 20.4 and 24.0 mg min⁻¹cm⁻², respectively. A slow non-linear dissolution profile of AST was obtained under the same conditions due to the formation of a stearate-rich layer on the surface. The release rate of albuterol from AST was consistent with its possible use for sustained release in the lung following aerosol delivery.

At 20°C and 50 %RH, 40% of the loaded dose of ALB was emitted from DPI compared to 60-67% for the salts. FP_{emitted} [mean (experimental range), n=3] were 77.7 (7.3), 63.6 (4.2), 9.0 (1.8) and 55.7 (3.4) for ALB, ASUL, AAD and AST, respectively. Emptying of the DPI was affected only in extreme environments (high temperature and RH). Increasing RH and temperature decreased FD, FP_{loaded} and FP_{emitted} of ALB and ASUL. These results for AAD and AST were slightly reduced at higher temperatures and humidities. While the solubilities of the various drug forms did not correlate with FD, FP_{loaded} and FP_{emitted} , there is clearly a need, in some circumstances, to define specific ranges of temperature and humidity for use during dry powder aerosol testing and use.

Education Summary

- July 1996 - Sept. 1998, Post Doctoral Student in Pharmaceutical Sciences, University of Maryland.
- Sept. 1994 - June 1996, Post Doctoral Student in Department of Pharmacy and Pharmaceutics, Medical College of Virginia at Virginia Commonwealth University working with Peter Byron.
- Aug. 1988 – Aug. 1994, Graduated with Ph.D. from Medical College of Virginia at Virginia Commonwealth University. Co-advisors, Peter Byron and Richard Dalby.
- Aug. 1985 - May 1988, College of Pharmacy, Bombay University, B. Pharm.

Employment Summary

- Initial Employer , [Dura Pharmaceuticals](#), San Diego, CA

Publications

- Beth L. Laube, **Rajkumari Jashnani**, Richard N. Dalby and Pamela Zeitlin. Targeting aerosol deposition in patients with cystic fibrosis: effects of alterations in particle size and inspiratory flow rate. *Chest*; 118:1069-1076 (2000).
- Beth L. Laube, **Rajkumari Jashnani** and Richard N. Dalby. predicting in vivo lung deposition of cromolyn sodium from in vitro estimates. *J. Aerosol Medicine*; 11 (Supplement 1), 35-42 (1998). Also presented at the international Society for Aerosols in Medicine Focus Symposium, towards meaningful laboratory tests for evaluation of pharmaceutical aerosols, San Juan, PR, January, 1997.
- **Rajkumari N. Jashnani**, Peter R. Byron and Richard N. Dalby. Testing of dry powder aerosol formulations in different environmental conditions. *International Journal of Pharmaceutics*; 113, 123-130 (1994).
- **Rajkumari N. Jashnani**, Peter R. Byron and Richard N. Dalby. Preparation, characterization, and dissolution kinetics of two novel albuterol salts. *Journal of Pharmaceutical Science*; 82 (6), 613-616 (1993).

Abstracts and Presentations

- Beth L. Laube, **Rajkumari Jashnani**, Richard N. Dalby and Pamela Zeitlin. Aerosol deposition in cystic fibrosis: effects of inspiratory flow rate. *International Conference on Aerosol Therapy*, Rome, Italy (1998).
- Richard N. Dalby, **Rajkumari Jashnani**, Dayna Jarvis and Varsha S. Chavan. Evaluation of aerosol output from ventilator circuits fitted with the Optivent and Aerovent in-line spacers. In *Respiratory Drug Delivery VI* (ISBN 1-57491-076-0), Richard N. Dalby, Peter R. Byron and Stephen J. Farr, Editors, Interpharm Press, Buffalo Grove, IL, 307-310 (1998).
- Richard N. Dalby, Dudley Demarest, R. Gary Hollenbeck, James Leslie, Martin P. Redmon, Stephen A. Wald, Varsha Chavan, Dayna Jarvis, **Rajkumari N. Jashnani**, DOUNGKAMOL LEAOKITTIKUL, Shailaja Somaraju and Julie Suman. In vitro metered dose inhaler performance: an accelerated stability study comparing Levalbuterol sulfate and Ventolin. *American Association of Pharmaceutical Scientists National Meeting, Pharmaceutical Research*, 14 (11), S136 (1997).
- **Rajkumari N. Jashnani**, Varsha Chavan, Richard N. Dalby, Dayna Jarvis, DOUNGKAMOL LEAOKITTIKUL, James Leslie, Bipin Mystery, Martin P. Redmon, Shailaja Somaraju and Linda Wong. Comparison of two particle sizing methods for an accelerated stability study of metered dose inhalers. *American Association of Pharmaceutical Scientists National Meeting, Pharmaceutical Research*, 14 (11), S146 (1997).
- M. Hindle, **R. N. Jashnani** and P. R. Byron. Dose emissions from marketed inhalers: influence of flow, volume and environment. In *Respiratory Drug Delivery IV* (ISBN 0-935184-61-9), Peter R. Byron, Richard N. Dalby and Stephen J. Farr, Editors, Interpharm Press, Buffalo Grove, IL, 137-142 (1994).
- **R.N. Jashnani**, P.R. Byron and R.N. Dalby. Effect of salt selection and environmental conditions on dry powder aerosol generation. *Drug Information Journal*, 29 (Supplement), 1654S (1995).
- **Rajkumari N. Jashnani**, Peter R. Byron and Richard N. Dalby. Validation of an improved rotating disk dissolution apparatus. *Journal of Pharmaceutical Science*, 82 (6), 670-671 (1993).
- **R.N. Jashnani**, P.R. Byron and R.N. Dalby. Dry powder inhaler performance in different environments. *American Association of Pharmaceutical Scientists National Meeting, Pharmaceutical Research*, 10 (10), S196 (1993).
- **Rajkumari N. Jashnani**, Peter R. Byron and Richard N. Dalby. Isolation and characterization of Albuterol in different physical forms. *American Association of Pharmaceutical Scientists National Meeting, Pharmaceutical Research*, 8 (10), S176 (1991).

Professional Affiliations

- American Association of Pharmaceutical Scientists (AAPS)

Honors and Awards

- United States Pharmacopeia Fellow (1992)
- John Wood Award for Excellence in Graduate Study of Pharmaceutical Sciences, given by Department of Pharmacy and Pharmaceutics, Medical College of Virginia at Virginia Commonwealth University (1994)

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