Spatially Resolved Characteristics of Pharmaceutical Sprays

A. R. Muliadi* and P. E. Sojka
Maurice J. Zucrow Laboratories
School of Mechanical Engineering
Purdue University
West Lafayette, IN 47906

Abstract

The inter-tablet variation in pharmaceutical tablet film-coating quality is attributed to spatial variations in spray mass and droplet wetting characteristics. The latter is governed by the size and velocity of the drops when they impact the tablets. Accordingly, spray data that show how spatial distributions of spray mass, drop size, and drop velocity vary with changes in spraying conditions are important, and are the subject of this study. In particular, this study characterized sprays produced by two different pharmaceutical nozzles (Schlick 930 and 970). Data show that all drop size distributions have small drops near the spray center and large ones at the periphery, and that drop velocity profiles are Gaussian, often with an offset peak. As expected, drop size decreases as atomizing air supply pressure increases, or when coating supply rate or viscosity decreases. Drop velocity decreases with increasing coating supply rate or an increase in gun-to-target distance, and increases with an increase in air supply pressure. Interestingly, an increase in shaping air pressure increases drop velocity for the 970 sprays, but decreases it for the 930 ones. There were four spray volume flux distributions: dumbbell-shaped, teardrop-shaped, elliptical with a maximum at the spray center, and elliptical with no distinct maxima. The length of the semi-major axis, as well as the distance separating the two maxima, increases with increasing coating supply rate or viscosity; both decrease as atomizing air pressure increases. Spray volume flux increases as coating supply rate or air supply pressure increases, and decreases as coating viscosity or gun-to-target distance increases.

Keywords: Pharmaceutical Sprays, Spray Drop Diameter, Velocity, Flux, Pattern, PDA.

A.R. Muliadi, amuliadi@purdue.edu