in initial therapy to control pulmonary and constitutional symptoms and signs in patients with chronic necrotizing pulmonary aspergillosis.

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REFERENCE

Measuring Nebulizer Output

To the Editor:

I read with interest the paper by Tandon et al (May 1997).They reported that the relationship between nebulizer output measured by weight loss and direct measurement of aerosol production remained relatively constant, so allowing nebulizer output to be estimated by a simple weighing technique.

Weight loss when a nebulizer is activated has two components: generated aerosol that contains active medication; and evaporation of solvent only (usually water) as the driving gas becomes fully saturated. It appears that the aerosol fraction of weight loss remains relatively constant regardless of temperature, but that the evaporative loss changes with temperature because a warm gas will require more water to become fully saturated than a cold one.²

Importantly, in the study by Tandon et al,¹ the nebulizers were run to dryness. During this period, the nebulizer and its contents would cool because of the required latent heat of evaporation as the dry compressed air supplied to the nebulizer became fully saturated, eventually reaching an equilibrium with the room environment, and attaining a relatively constant operating temperature. In these circumstances, it is likely that Tandon et al are correct in their conclusion that the aerosol fraction of weight loss remains approximately constant. Once the relatively constant operating temperature has been reached, both aerosol and evaporative loss will remain relatively constant.

However, if a nebulizer is activated at a nonconstant temperature, the evaporative fraction of weight loss will change, decreasing as the nebulizer cools. These circumstances are likely to exist when a nebulizer is activated repeatedly for short periods, such as in inhalation dosimetry. In these circumstances, evaporative loss will vary with nebulizer reservoir temperature,²,³ and the relationship between weight loss and aerosol production will not be constant. Direct calibration of nebulizer output should remain the preferred technique in these circumstances.

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REFERENCES
4 To the Editor:

The questions raised by Dr. Beach are important. The study by Dennis et al,¹ cited by Dr. Beach, clearly pointed out discrepancies between simple gravimetric analysis and direct measurement of aerosolized solute. However, in our study,² we found that there was an unexpected correlation between changes in weight and captured aerosol for a large number of devices and conditions.

Dr. Beach raises the point that our nebulizers were "run to dryness," and from temperature considerations, our results may not apply for nebulizers used for short periods, such as for inhalation dosimetry. He cited Dennis et al and Kongerud et al, which those authors found changes in temperature during short periods of nebulization. However, each data point in our experimental protocol represented a 2-min period of nebulization, similar to the protocols of Dennis et al and Kongerud et al and protocols of inhalation dosimetry. This experimental design provided a series of 2-min points throughout the nebulization of a given nebulizer charge. We did not observe any systematic differences from data points obtained at the beginning or the end of the series. From the data of Dennis et al,¹ temperature varies considerably over the early stages of nebulization. Therefore, any changes in temperature over this period should not affect our conclusions.

Finally, we are in complete agreement with Dr. Beach when he states that direct calibration of nebulizer output is preferred. In all studies that involve human subjects and in detailed bench studies before clinical trials of aerosol therapy, we have always measured aerosol output directly when we perform assessments of different delivery systems.³ Our study,² however, indicated that gravimetric analysis can be useful as a rapid screening technique for testing a large number of devices under various conditions of use to assess the major differences between devices before making a commitment to quantitative trials.

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Patient Selection for Pulmonary Artery Catheterization

To the Editor:

Karak et al³ deserve recognition for demonstrating the utility of digital subtraction angiography and subsequent transcatheter