Variability in Jet Nebulizer Output

To the Editor:

We read with interest in the February 1992 issue of Chest the article by Alvine and colleagues on the reliability of jet nebulizers. The authors discuss in detail the differences in fluid output and particle size between different jet nebulizers and the potential effects on clinical response. Unfortunately, they fail to consider the crucial aspect of drug output, assuming as others have done, that it follows fluid output, an incorrect assumption for salbutamol, antibiotics, and sodium cromoglicate.

This variability in both fluid and drug outputs is of concern to clinicians. Of greater importance would be any variations in output between nebulizer units from the same manufacturer. We have examined this by measuring both fluid and drug output from four nebulizers with the same batch number from one manufacturer (System 22, Medic-Aid, Chichester, England).

A single nebulizer was weighed before and after the introduction of 2 ml of 50:50 normal saline-salbutamol solution (Ventolin Respirator solution containing salbutamol sulfate, 5 mg/ml, Allen & Hanbury). The nebulizer was then run for a predetermined period using air from an electric compressor at a verified flow of 9 L/min. The unit was weighed again after nebulization to give the fluid output (corrected for weight of the salbutamol respirator solution). Five 100-μl aliquots were taken from the solution remaining within the nebulizer unit for analysis of salbutamol by ultraviolet spectrophotometry (SP400 UVVIS spectrophotometer, Pye Unicam, Cambridge, England). From the absorbance at 225 nm, the concentration of salbutamol was calculated by reference to a standard calibration curve constructed using analytical-grade salbutamol sulfate. With knowledge of the initial concentration and weight change, the salbutamol output at each time interval could be calculated.

The nebulizer unit was then carefully washed and dried before the procedure was repeated for a different time period. Runs were performed at 1-min intervals up to 10 min for each of the 4 nebulizer units. Figure 1 shows the salbutamol output of each unit.

![Graph showing variability in jet nebulizer output](image-url)

**Figure 1.** Salbutamol output from four nebulizers with identical batch numbers. Results are expressed as a percentage of the starting amount at 1-min intervals up to 10 min. Each time point is the mean of five analyses.

**REFERENCES**


Communications to the Editor

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There was a greater output of fluid than salbutamol, which led to small increases in the salbutamol concentration within the nebulizer. Fluid and salbutamol outputs were reasonable but less than ideal for units C and D. Unit A was more variable in its output, although the 10-min results were similar to those achieved with units C and D. The fluid and drug outputs from unit B were poor, with less than 20 percent of the salbutamol being delivered after 10 min.

Although differences in fluid output are recognized between manufacturers, the results we have obtained illustrate the variation in drug output that may occur between nebulizer units from the same batch. The peak salbutamol output occurred at 10 min and ranged from 18.3 percent to 54.1 percent of the initial 5-mg fill. If medical practitioners are to prescribe high doses of bronchodilators, it must be with the knowledge that this is what the patient receives; for some nebulizer units this is clearly not so. The onus of providing this information must be placed with the manufacturers.

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Pneumocystis carinii Pneumonia and Methotrexate Therapy

To the Editor:

In the February 1992 issue of Chest, Chechani and Bridges reported Pneumocystis carinii pneumonia in four patients with connective tissue disease; of these, two were receiving corticosteroids plus low-dose oral methotrexate, and a third was receiving cyclophosphamide (100 mg/d). We have recently reported the case of a patient with laryngeal carcinoma treated with low-dose methotrexate who developed P carinii pneumonia. We found a reduced CD4 helper count (150/μm3) in this 65-year-old human immunodeficiency virus-negative man who had received a 500-mg cumulative dose of methotrexate over five months prior to developing P carinii pneumonia. We are now aware of a total of 12 well-documented cases of P carinii pneumonia complicating low-dose methotrexate therapy for indications that include rheumatoid arthritis (5 cases), polymyositis (2 cases), dermatomyositis (1 case), and asthma (2 cases). Ten of these patients had cumulative dosages of methotrexate that exceeded 400 mg, and one patient had a documented cumulative methotrexate dosage that was less than 400 mg; in one case, the dosage was not reported.

These cases suggest that P carinii pneumonia represents a not infrequent complication of prolonged low-dose oral methotrexate therapy, whether administered for connective tissue disorders or other diseases. Although immunosuppression is reported to be uncommon in methotrexate-treated patients,^8 the frequency of P carinii infections after prolonged use of this agent indicates the need for reexamining this belief and for determining the frequency and severity of CD4 depression resulting from this agent.

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Role of Fiberoptic Bronchoscopy in Diagnosis of Pulmonary Tuberculosis in Patients at Risk for AIDS

To the Editor:

In an article that appeared in the May 1992 issue of Chest, Miro et al conclude that transbronchial biopsy does not contribute significantly to the diagnosis of tuberculosis. Major shortcomings of this study and its conclusions should be pointed out. Of the 27 patients with HIV risk factors who underwent bronchoscopy, only 18 had clinical evidence of HIV infection. It is unclear whether findings based on this group of patients can be extrapolated to those who actually have HIV infection. In addition, it is difficult to understand why patients with acid-fast bacilli on sputum smear were included in the analysis, since bronchoscopy is not indicated for the diagnosis of tuberculosis in these cases.

The authors state that transbronchial biopsy has been shown not to contribute to the diagnosis of tuberculosis in patients without HIV infection, and cite a study that evaluated only 12 patients. A more balanced view of the literature indicates that histopathologic findings of granulomata on transbronchial biopsy provide the exclusive means for a rapid presumptive diagnosis of tuberculosis in 10 to 26 percent of patients with tuberculosis who undergo bronchoscopy. In a study of patients with HIV infection at our institution, transbronchial biopsy provided the exclusive means for rapid diagnosis of tuberculosis in 6 of 59 cases. These data suggest that, despite the reduced frequency of granuloma formation in patients with HIV infection, transbronchial biopsy contributes incremental diagnostic information in some patients. The data presented in the report by Miro et al do not allow evaluation of the contribution of transbronchial biopsy to the rapid diagnosis of tuberculosis.