

**advance**  
FOR ADMINISTRATORS IN  
**RADIOLOGY**  
& RADIATION ONCOLOGY

November 1998, Page 22

**NUCLEAR MEDICINE:  
NEW RADIONUCLIDE NEBULIZER DESIGN  
IMPROVES SCAN QUALITY**

New improvements in the design of the radionuclide nebulizer used in ventilation/lung scanning have resulted in decreased particle size. Although this improves scan quality, it also increases patient breathing times. At Cedars-Sinai Medical Center in Los Angeles, researchers tested a new modification of an aerosol system that reduces patient breathing time greater than by one-half while producing particle sizes that enhance scan quality, according to a scientific paper from the 45th Annual Meeting of the Society of Nuclear Medicine, in Toronto. Mark C. Hyun, CNMT, RT(R)(N), chief technologist at the hospital was senior author of the paper that outlined the results of their research on the new system.

When a pulmonary embolism (PE) is suspected, patients are injected with a radionuclide particle that accumulates in areas of the lung receiving blood flow. Interruptions in blood flow to areas of the lung can be caused by the PE or by underlying chronic pulmonary disease, tumors or effusions. To distinguish between the PE and other factors preventing adequate blood flow to the lungs, a ventilation scan is performed in conjunction with the perfusion scan. Areas with normal ventilation but reduced or absent perfusion are considered to represent intermediate to high probability for a PE. The most common protocol is to do the ventilation scan first, immediately followed by the perfusion study.

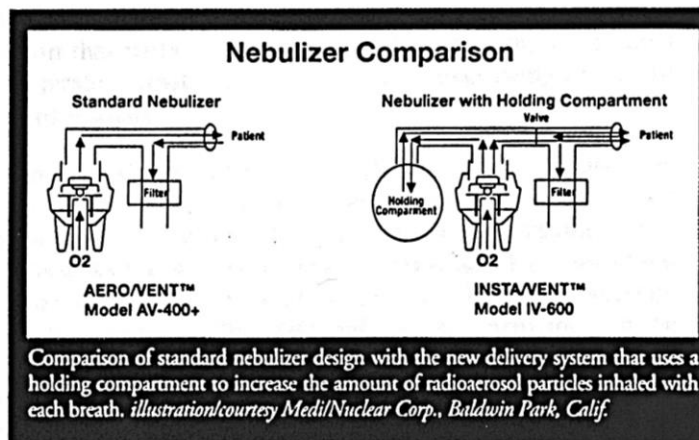
Ventilation lung scanning can be performed using a gas—such as Xenon-133—or small aerosol particles of a liquid radioisotope. Because of special requirements for trapping and preventing release of Xenon-133, many departments use the radioaerosol nebulizer for this procedure. The aerosol nebulizer has the added advantage of allowing portable scans at the patient's bedside and the ability to obtain multiple views.

If the particle size of the aerosol mist from the nebulizer is too large the aerosol may not penetrate into the periphery of the lung, making interpretation of the images difficult. Large particles may also absorb humidity from the breathing environment, enlarging the particles and resulting in tracheal and central airways deposition, thereby degrading the quality of the scan.

Reduction in particle size, while giving better quality scans, extends the time that the patient must breathe on the ventilator, both because of reduced nebulization rate and the reduced ability

of the particles to carry radioactive material to the lungs. "These are usually very sick patients, so breathing on a ventilator system for five minutes may be very difficult for them," says Hyun. "The scan can be compromised if the patient cannot complete the entire ventilation study. We, therefore, looked at ways to reduce the breathing time." Hyun tested a new nebulizer design, provided by the Medi-Nuclear Corp. of Baldwin Park, Calif. This system uses a holding system to capture aerosol particles that would otherwise be wasted and, therefore, increase the amount of aerosol particles that the patient inhales.

"When the patient breathes on a regular nebulizer system, there is a lot of waste because both the air that the patient breathes out and the aerosol generated during the exhalation time is exhausted through the filter," he explains. The new design uses a holding bag inside the system to contain the unused portion of the generated aerosol. During inspiration, pa-



tients inhale particles from the nebulizer and the holding bag, potentially doubling the amount of dose that enters the lungs. "We used this system on over 100 patients," states Hyun. "The modification allowed us to decrease the breathing time from five minutes to two-and-one-half minutes without compromising quality."

A high-resolution collimator is used for lung scanning at Cedars-Sinai. With a general purpose collimator, the length of time needed to obtain sufficient counts with this system might be even less than two-and-one-half minutes, notes a spokesperson for the manufacturer.