



4610 Littlejohn Street, Baldwin Park, CA 91706
(800) 321-5981, (626) 960-9822 Phone
(626) 960-8700 Fax
info@medinuclear.com
www.medinuclear.com

Studies Using the Aero/Vent™

Peer-Reviewed Literature:

1. Kuni, C. C., Ducret, R. P., Nakhleh, R. E., and Boudreau, R. J. "Reverse Mismatch Between Perfusion and Aerosol Ventilation in Transplanted Lungs". *Clinical Nuclear Medicine* 1993. 18.4: 313-317.

Abstract: Thirty ventilation-perfusion pulmonary scintigraphic studies were performed in 13 patients who had undergone unilateral lung transplantation. Ventilation-perfusion mismatch (ventilation better than perfusion) was judged absent, mild, moderate, or severe in the transplanted and native lungs. Ventilation-perfusion mismatch was significantly worse in the transplanted lungs ($p < .0001$). Findings of lung biopsies and chest roentgenograms failed to correlate with the severity of ventilation-perfusion mismatch. Hypoxic pulmonary vasoconstriction appears to be significantly impaired in most unilateral lung transplants; the mechanism for this impairment is unclear.

"Ventilation scintigraphy was performed with an aerosol of Tc-99m DTPA in saline solution delivered by an AERO/VENT lung aerosol unit (Medi-Nuclear Corp., Baldwin Park, CA). The manufacturer specifies that 65% of droplets delivered by this system are less than 0.3 microns in mass median aerodynamic diameter, that 28% are between 0.3 and 0.6 microns, and that 95% of droplets with diameters greater than 0.6 microns are removed by a filter" (313).

2. Kao, Hung-Chia, Lin, Hui-Tzu, Yu, Shu-Ling, Wang, Shyh-Jen, and Yeh, Shin-Hwa. "Supine Lung Clearance of Tc-99m DTPA and HMPAO Aerosols". *Clinical Nuclear Medicine* 1995. 20.7: 633-635.

Abstract:

Study objectives: Paraquat, a widely used herbicide, has been shown to cause severe and often fatal pulmonary fibrosis in humans and laboratory animals. Although paraquat is known to be directly cytotoxic to lung parenchyma, changes in routine lung scintigraphy results after acute paraquat intoxication have not been reported. The objective of this project was to investigate changes in lung ventilation (LV) and alveolar permeability (AP) in patients with paraquat intoxication, using ^{99m}Tc diethylenetriamine pentaacetate (DTPA) radioaerosol lung scintigraphy.

Design: Prospective, blinded study.

Setting: Nuclear medicine and toxicology departments in two university-affiliated teaching hospitals.

Patients or participants: Thirteen patients with acute paraquat intoxication were included in this study. Ten volunteers without acute paraquat intoxication were studied for comparison. **Measurements and results:**

^{99m}Tc DTPA aerosol inhalation and ^{99m}Tc macroaggregated albumin (MAA) perfusion lung scintigraphies were performed to determine LV, AP, and lung perfusion (LP). Five of the 13 patients (38%) had significant LV abnormalities; 3 of these 5 patients also showed abnormal LP. Of the 13 patients, 4 patients (31%) showed normal AP and survived. The remaining 9 patients (69%) showed abnormal AP and died. The mean values for AP were statistically different ($p < 0.01$) between survivor ($0.72 \pm 0.16\%$) and nonsurvivor ($1.52 \pm 0.40\%$) groups. Data from the normal volunteers and survival patients showed a ^{99m}Tc clearance slope $< 1.00\%$. Data from patients who died showed a clearance slope $> 1.00\%$. **Conclusion:** These results indicate that AP, measured by ^{99m}Tc DTPA aerosol inhalation lung scintigraphy, may help predict outcome in patients with paraquat intoxication.



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"The radioaerosols (particle size, approximate aerodynamic median mass diameter of less than 1 μm at 7 liter/minute air flow rate) were generated from a commercial lung aerosol delivery unit (AERO/VENT, MEDI NUCLEAR, Baldwin Park, CA) containing 20mCi Tc-99m DTPA/HMPAO in 2 ml saline" (633).

3. Changlai, Sheng-Ping, Kao, Chia-Hung, Wang, Shyn-Jen, Lin, Wan-Yu, and Lan, Joang-Liang. "The Change in the Distribution of Tc-99m Human Serum Albumin Radioaerosols in Asthma After a 1-Week Course of Corticosteroid Inhalation Treatment". *Clinical Nuclear Medicine* 1995. 20.7: 626-629.

Abstract: This study evaluated the effects of corticosteroid inhalation on the deposition pattern of Tc-99m HSA radio-aerosols in 24 patients with asthma. The homogeneous degree of depositing radioaerosol was quantitatively evaluated using a modified standard score system over both lungs. The baseline scores were calculated before inhalation therapy of 0.05 mg beclomethasone dipropionate four times daily for 1 week. The studies were then repeated after treatment to evaluate the effects of inhalation therapy. After treatment, the scores decreased in 16 of 24 cases (67%), which means that the degree of the bronchial obstruction decreased. The statistical results revealed significant differences in the total homogeneity score ($P < 0.001$) before and after therapy. Thus, a 1-week course of beclomethasone dipropionate inhalation therapy improves the bronchial obstruction in asthma patients as shown by the quantitative homogeneity score system of the Tc-99m HSA radioaerosol inhalation lung scintigraphy.

"The Tc-99m HSA radioaerosol was generated by a commercial lung aerosol delivery unit (AERO/VENT, model AV-400 MEDI-NUCLEAR, Baldwin Park, CA) that contained 20mCi Tc-99m HAS in 2 ml saline" (626).

4. Wang-Shyh-Jen, Kao, Chia-Hung, Lin, Wan-Yu, Hsu, Chung-Yuan, Chang, Cheng-Pei, and Lan, Joang-Liang. "Effects of Inhalation of Steroids on Lung Permeability in Patients with Asthma". *Clinical Nuclear Medicine* 1995. 20.6: 494-496.

Abstract: This study evaluated the effect of inhalation of steroids on lung permeability in patients with asthma by measuring the clearance of Tc-99m DTPA aerosol from the alveolar to vascular space. Twenty patients with asthma were studied in the supine position with a gamma camera and the clearance half time ($T_{1/2}$) was calculated. The base line lung permeability study was performed before treatment with inhalation of 100 μg beclomethasone dipropionate four times daily for 1 week, then the study was repeated. After treatment with inhalation of steroid, there was a change in $T_{1/2}$ from 76.4 \pm 37.4 minutes to 86.6 \pm 48.2 minutes ($P = 0.08$). This preliminary study suggests that lung permeability is not altered by inhaled steroid therapy.

"The Tc-99m DTPA radioaerosol was generated by a commercial lung aerosol delivery unit (AERO/VENT, model AV-400 MEDI-NUCLEAR, Baldwin Park, CA)" (494).