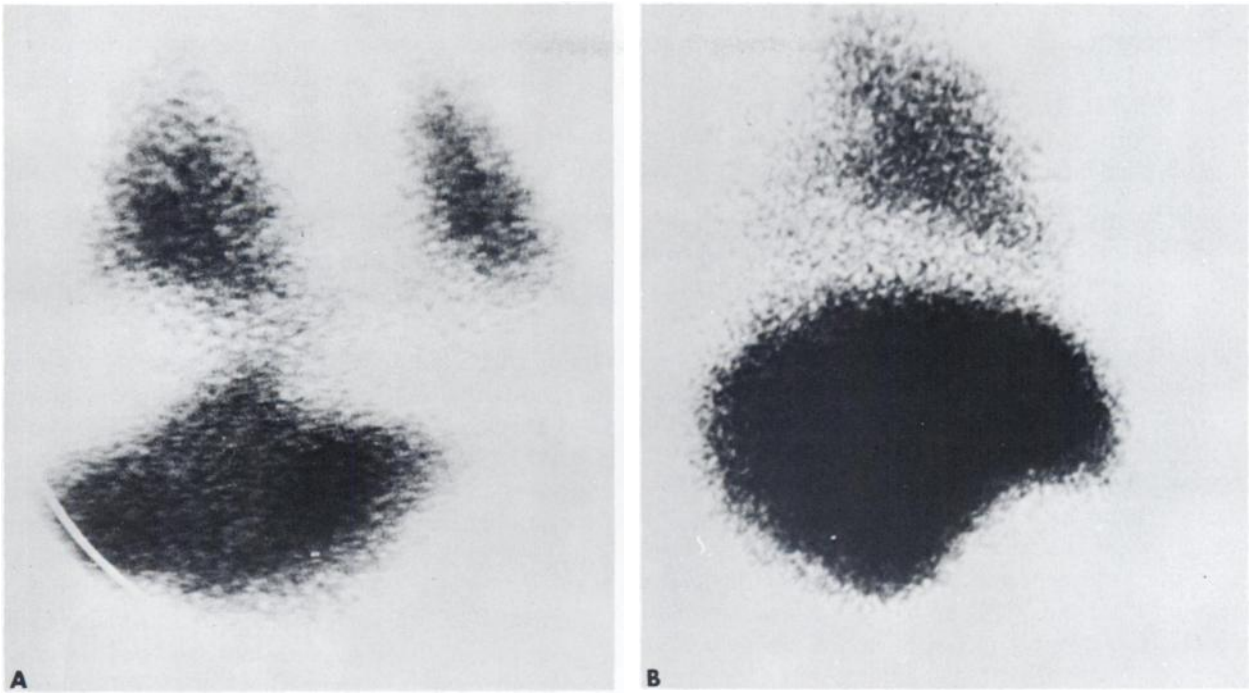

FIG. 2. A is abnormal anterior view of liver and lung showing definite separation of liver and lung in superior lateral area. B shows separation of liver and lung in right lateral position. Liver scans were made with ^{99m}Tc-sulfur colloid; lung scans with ^{131}I-macroaggregated albumin.

of the Polaroid camera (or inserting the slide in the photoscope cassette) the spectrometer is changed to the proper settings for ^{99m}Tc. Two hundred thousand additional counts are obtained in 3–4 min. This technique superimposes both organs on a single film.

Figure 1A is a normal anterior view of a superimposed liver and lung scintiphoto showing no detectable separation between the liver and lung. Figure 1B shows a normal right lateral liver and lung scintiphoto again with no detectable separation.

Figure 2A is an abnormal anterior view showing definite separation of the liver and lung in the superior lateral area. Figure 2B shows the separation of the liver and lung in the right lateral position.

Thus, a technique for the detection of suspected subdiaphragmatic abscess is readily available for those hospitals that are presently performing liver scans with ^{99m}Tc-sulfur colloid and lung scans with ^{131}I-macroaggregated albumin using a gamma scintillation camera.

GARY D. GALLAMORE
Jersey Shore Medical Center
Neptune, New Jersey

MONITOR FOR ^{133}Xe CONTAMINATION OF AIR

We have recently begun doing ^{133}Xe ventilation studies and have found a simple, inexpensive way to monitor background radiation levels from ^{133}Xe airborne contamination. In general, we found that when most nuclear medicine laboratories have been faced with the decision of whether to buy a gas monitor, which commonly costs a few thousand dollars, or to ignore monitoring completely on the assumption that exhaust fans adequately keep airborne contamination below acceptable levels, they usually chose the latter alternative. Even though the biological half-life of ^{133}Xe is measured in seconds, if there should be an exhaust fan failure or if room ventilation is inadequate, there is a radiation hazard for the patient and especially for the radioisotope technician. Also, from a health physics point of view, it should be proven in each laboratory that the maximum permissible concentration (MPC) of ^{133}Xe in air of 3×10^{-7} μCi/ml is indeed not exceeded in uncontrolled areas during ^{133}Xe studies.

The dose delivered at a point P a distance r from a small volume of air containing a concentration C (μCi/cc) of gamma-emitting gas characterized by

$$\Gamma\left(\frac{\text{mR}}{\text{hr}}\frac{\text{cm}^2}{\text{mCi}}\right)$$

is

$$dD = e^{-\mu r}\frac{\Gamma}{r^2}C(\vec{r})\,r^2 dr\,d\Omega \qquad (1)$$

in which dD is the dose in mR/hr, μ is the linear absorption coefficient for the gamma emitter, and $d\Omega$ is the solid angle subtended at P by the small volume of air $r^2dr\ d\Omega$. The total dose delivered at P where the detector is to be placed is then the integral of all volume elements of air containing isotope. Let us assume for simplicity that $C(\vec{r})$ is constant; i.e., that the isotope is homogeneously distributed throughout the air around P. Then

$$D = 4\pi\,\Gamma C\int_0^R e^{-\mu r}\,dr$$

$$= 4\pi\frac{\Gamma C}{\mu}(1 - e^{-\mu r}) \qquad (2)$$

in which R is the radius of air around P which contains the isotope. R could be roughly defined by the volume-equivalent sphere of the room used. However, since the need for a monitor is to provide detection before the MPC has been reached, we may assume R is about 1 meter. Since μ is about 0.2×10^{-3} cm^{-1} for air with gamma energies of 80 keV, Eq. 2 reduces to

$$D = 4\pi\,\Gamma\,CR. \qquad (3)$$

For ^{133}Xe, $\Gamma = 0.44\frac{R}{hr}\frac{cm^2}{mCi}$; the MPC $= 3 \times 10^{-7}$ μCi/ml in an uncontrolled area, and 1×10^{-5} μCi/ml in a controlled area (New York State Industrial Code-Rule No. 38 Radiation Protection, Sections 38.22.2, 38.21.2, 38–41). Substituting these values into Eq. 3 and assuming R = 1 meter, $D = 1.6 \times 10^{-4}$ mR/hr in the first case and 5.3×10^{-3} mR/hr in the second.

To calibrate the detector placed at point P, one can use a small standard, with activity of perhaps 1 μCi, placed 1 meter from P. Cobalt-57, for example, with a Γ of about $0.5\frac{R}{hr}\frac{cm^2}{mCi}$ and a gamma spectrum sufficiently comparable to ^{133}Xe, gives a dose of 0.5×10^{-4} mR/hr/μCi at P, 1 meter from the ^{57}Co.

We have used for our background detector an unshielded (except for radiation directly from patient or ^{133}Xe cylinder) gamma-sensitive G-M tube (Nucleonic Corp. of America Model B-2); however, almost any beta-insensitive G-M tube of similar volume would do. If a beta- as well as gamma-sensitive G-M tube were used, a separate calculation would have to be done for the beta response. The tube was connected to a vintage Model 1615-B, Nuclear-Chicago vacuum-tube ratemeter. This ratemeter drives the galvanometric chart recorder Model 8435, Nuclear-Chicago. If one does not have such equipment available, one can simply use a G-M tube with a ratemeter and chart recorder borrowed from a renogram apparatus. The permanent record of background from the chart recorder is very helpful. One can in addition attach an alarm or blinking light to be triggered by off-scale readings on the chart recorder. Our system using the calibration scheme described above can detect 0.5×10^{-4} mR/hr which is about 30% of the MPC in an uncontrolled area assuming a 1-meter radius sphere. This method is presently within the equipment capabilities of most radioisotope laboratories.

STEPHEN RUDIN
HIRAM HART
Montefiore Hospital & Medical Center
Bronx, New York