

A NEW RADIOPHARMACEUTICAL FOR COMBINED LUNG-LIVER SCAN—

PRELIMINARY EXPERIMENT IN ANIMALS

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Animal experiments with a ^{87m}Sr -strontium calcium-phosphate complex as a combined lung-liver scanning agent showed excellent visualization. Further studies are needed before this radiopharmaceutical is used in clinical practice.

The purpose of this paper is to report the initial experience with a new radiopharmaceutical for combined lung-liver scan.

MATERIALS AND METHODS

Strontium-87m, a short-lived (2.8 hr, 388-keV gamma) daughter of ^{87}Y (14 hr) was eluted from the generator with 0.005% citric acid. An aqueous solution of inorganic phosphate was prepared by mixing dibasic and monobasic sodium phosphate in their proper amounts to give a pH of 7.4. A 10% solution of calcium gluconate was obtained from Upjohn Company. A mixture of 1 ml radiostrontium eluate and 1 ml phosphate buffer was prepared. To this was added 0.1–0.3 ml of calcium gluconate solution. With gentle shaking, the solution turned white with small and medium particles suspended in it. The final mixture was injected intravenously to five dogs, each weighing between 10 and 15 kg. Immediately after injection, the thoracoabdominal area of the dog was scanned in dorsal and right lateral positions with a Nuclear-Chicago Pho/Gamma camera using a 1,000-hole parallel-bore collimator. A counting rate of 60K per min was obtained with the use of 2–3 mCi of ^{87m}Sr . A total count of 300K was collected to obtain good images. Similar experiments were carried out in another group of five dogs with artificial subdiaphragmatic abscess.

RESULTS

Excellent imaging of lungs and livers was obtained with this radiopharmaceutical. Figure 1 shows the

scintiscans of a normal dog's lungs and liver obtained within 3–5 min after injection. Figure 2 represents the lung-liver scintiscans of a dog with an artificial subdiaphragmatic abscess. Tissue distribution studies showed that about 50% of the injected dose was localized in the lungs, 30% in the liver, and 20% in the remaining carcass.

The $T_{1/2}$ disappearance from both lungs and liver ranged from 1 to 2 hr. The size and shape of the particles were determined with a hemocytometer and microscope. The size of the larger particles varied between 10 and 50 μ . The smaller particles which are probably trapped in the liver were less than 1 μ as determined by electron microscopy, Millipore filter, and dialysis bag.

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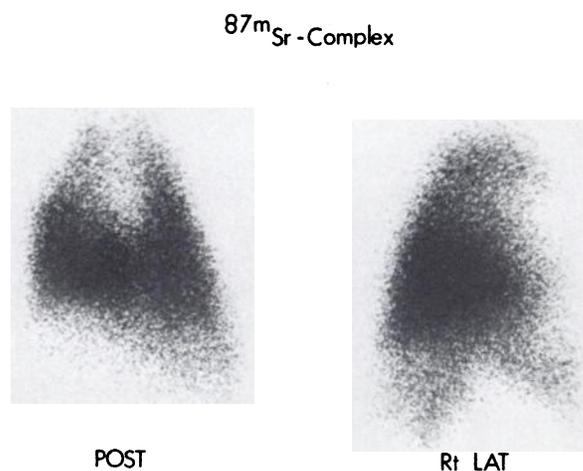


FIG. 1. Posterior and right lateral scintiscans of dog's lungs and liver obtained within 3–5 min following injection of ^{87m}Sr -strontium-calcium-phosphate complex.

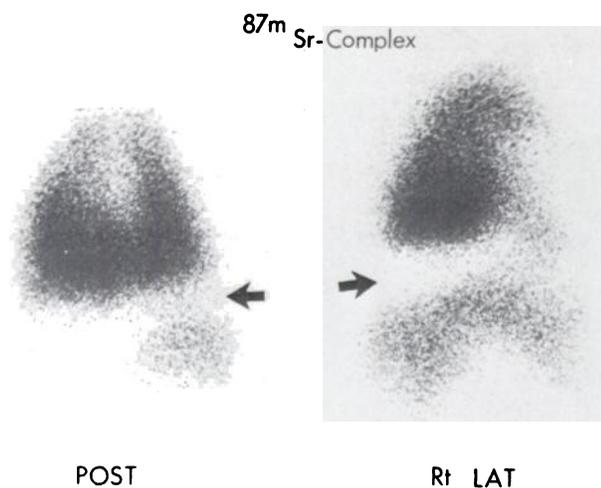


FIG. 2. Lungs and liver scintiscans of dog (with artificial subdiaphragmatic abscess) obtained within 3–5 min after injection of ^{87m}Sr -complex. Note gap (arrow) between lungs and liver. (Post = posterior view, rt lat = right lateral view).

DISCUSSION

Since the introduction of combined lung-liver scans by Brown (1,2), the technique has been widely used as a diagnostic tool for the detection of subdiaphragmatic abscess. At present, this is often accomplished by separate injections of two different radiopharmaceuticals, namely ^{131}I -MAA and ^{99m}Tc -sulfur colloid, and changing the setting of the scanner at the respective energy levels of the two radionuclides.

The complex of radiostrontium, inorganic phos-

phate, and calcium contains a mixture of macroaggregates and colloids enabling one to perform both lung and liver scans following a single injection without changing the isotope peak. The suspension contains strontium phosphate and calcium gluconate in such proportion that they do not form solely colloids or macroaggregates but a mixture of the two. The physiological aspects of this interesting observation is explained by the fact that strontium and phosphate form a colloidal suspension (3,4). The added calcium converts some colloids to macroaggregates (5). This results in a mixture of colloids and macroaggregates in the same solution enabling scans of both lungs and liver to be performed simultaneously.

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