IMPROVEMENTS IN THE PREPARATION OF ^{99m}Tc-LABELED MACROAGGREGATED FERROUS HYDROXIDE (Tc-MAFH)

In our recent article in the *Journal of Nuclear Medicine* (*J. Nucl. Med.* **10**:737, 1969) we described the preparation of and clinical experience with the lung perfusion scanning agent Tc-MAFH. After some months of routine preparation of this agent, it became evident that the process was subject to some variation in batch quality since occasional batches resulted in higher than usual uptake in the liver and spleen. It was also reported to us that other Australian laboratories were experiencing difficulties in preparing Tc-MAFH using this technique.

A critical re-examination of the process and the product revealed that the proportion of small ferrous hydroxide particles increased if minor changes were made in the processing routine. It was also noted that the product could be further degraded by mechanical damage during the shaking of the bottle to resuspend the particles.

It has been found that the soft gelatinous ferrous hydroxide particles can be strengthened simply by adding a small amount of human serum albumin to the final suspension just before autoclaving. In the heat of the autoclave the albumin coagulates and forms a tough skin around the ferrous hydroxide particles. These particles are extremely resistant to mechanical damage, the size range is narrowed to 30–50 microns, the shelf life of the preparation is increased to more than 24 hr and the uptake in the lungs of rabbits exceeds 99.5% of the injected dose. In clinical use the modified Tc-MAFH is extremely successful and is supplied daily to nuclear medicine centers throughout the Commonwealth of Australia; so far there has not been one case of a reaction reported from more than 1,000 patients.

The modified radiochemical processing details are as follows.

The ^{99m}Tc-pertechnetate in 5-ml isotonic saline solution is placed in a sterile vial with a Teflon coated magnet; 1 ml ferrous sulphate solution (1 mg Fe^{2+}/ml) and 0.5 ml stannous chloride solution (1.2 mg Sn^{2+}/ml) are added, and the solutions are then mixed on a magnetic stirrer. The pH of the solution is raised to 7–8 by the rapid addition of 0.2 *N* sodium hydroxide (0.28 ml).

The suspension of green ferrous hydroxide is transferred by means of a Pasteur pipette into a sterile polypropylene centrifuge tube and spun for 1 min at 360 rpm. The supernate is drawn off and discarded, the residue is resuspended in 6 ml of sterile isotonic saline and the mixture is centrifuged again for a further 1 min at 360 rpm. The supernate is drawn off and discarded.

The residue is transferred in 7 ml saline to a sterile multi-dose vial to which is then added 2 ml gelatin solution (10 wt%) and 0.5 ml stannous chloride solution (1.2 mg Sn^{2+}/ml). The final pH of the solution is adjusted to pH 6.5–7.5 by the addition of 0.12 ml of 0.2 *N* sodium hydroxide. Human serum albumin solution (10 mg/ml, 0.25 ml) is added to the vial which is capped and sealed. To prevent thermal decomposition during the autoclaving process, the bottle cap is punctured with sterile needles and the air inside the bottle is displaced with oxygen-free nitrogen. The needles are then removed, and the vial is autoclaved at 121°C for 33 min. The vial is then cooled under running water and shaken vigorously to disperse the clumped precipitate. The preparation is now ready for use. The vial can be stored in a refrigerator, but this may bring about a setting of the gelatin vehicle. To overcome this the vial should be gently warmed after removal from the refrigerator and shaken gently to resuspend the particles.

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