^{99m}TC MACROAGGREGATED ALBUMIN (^{99M}TC-MAA): VALIDATION OF PREPARATION PROTOCOLS FOR LUNG SCINTIGRAPHY IN PEDIATRIC PATIENTS





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PP-025

Background

^{99m}Tc-MAA (Pulmocis®):

- compounded radiopharmaceutical indicated in lung scintigraphy.
- can be used in infants and children with dose adjustments made based on weight.
- European Association of Nuclear Medicine (EANM) recommendations: to reduce the number of administered particles depending on age in order to embolize no more than 0.1% of the total lung capillary vessels.

→ Therefore, removing an amount of particles before labelling it with 99mTc is needed.

We use two different protocols: half of MAA is removed for infants and children older than 1 month (P1) and four fifth for infants younger than a month (P2). The rest of MAA is then labelled with a sodium 99m pertechnetate solution,

Objectives

This additional step in compounding the 99mTc-MAA is not included in the manufacturer's instructions.

Our goal is to validate the preparation protocols for pediatric use by controlling the quality of the preparations.

Methods

- **Preparation**
- 3 extemporaneous preparations were made for protocol P1 (prep. 1,2 et 3)
- 3 extemporaneous preparations were made for protocol P2 (prep. 4,5 et6)
- Activity of preparations was between 444 and 555 MBq (volume of 10 mL)
- **Tests**
- 3 samples for each preparation tested at H=0, H=0.5h, H=1h, H=2h, H=3h, H=4h, H=5h, H=6h, H=7h et H=8h after radiolabelling (shelf life of 8h)
- pH determined with pH paper
- Radiochemical Purity (RCP) determined with thin layer chromatography

- RCP assesses radiolabelling efficiency.
- For the preparation of 99mTc-MAA, a thin layer chromatography is used:

17CHR paper

Mobile phase: methylethylketone

Scan with a radiochromatograph

Determination : RCP (%) = $100\% - \%^{99m}Tc_{free}$

Calculation

• Calculation of mean and standard deviation of the 3 RCP obtained at each timepoint



The preparation had to comply with a level of 95% RCP and pH levels between 5 and 7

Results

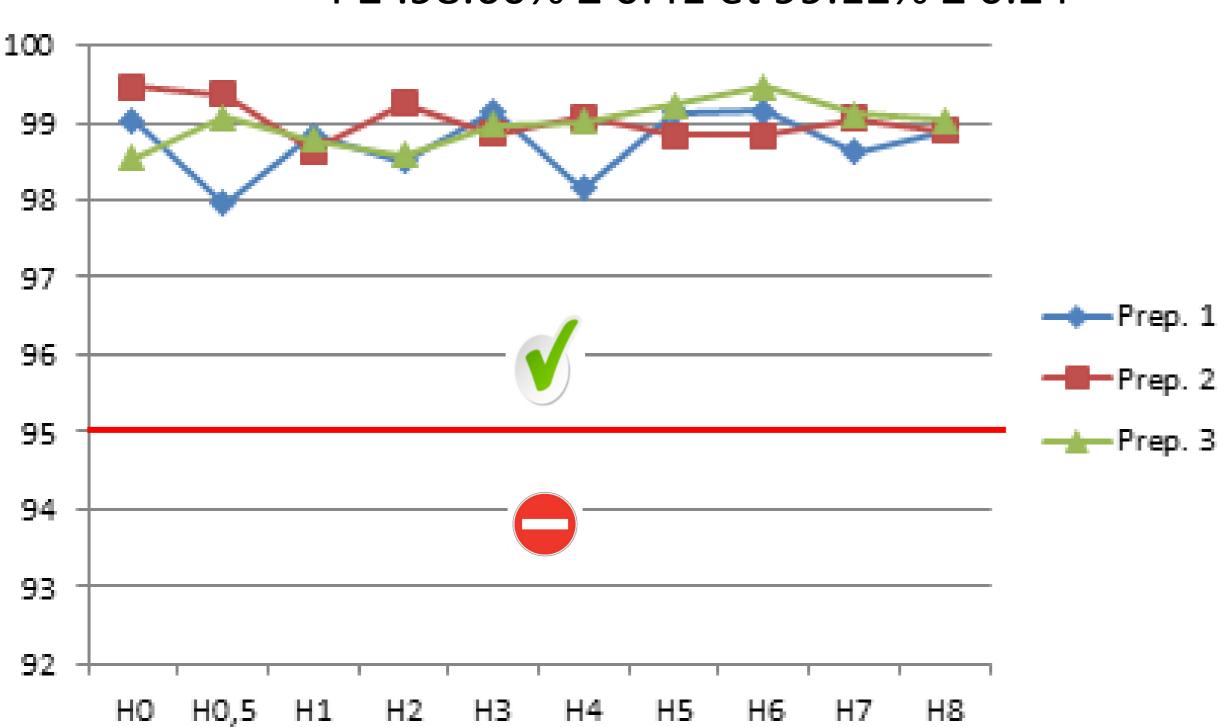
180 samples were analyzed in total:

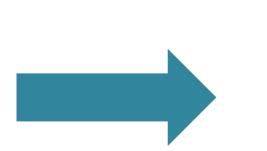
pH level is between 5 and 7

Mean RPC for all samples was:

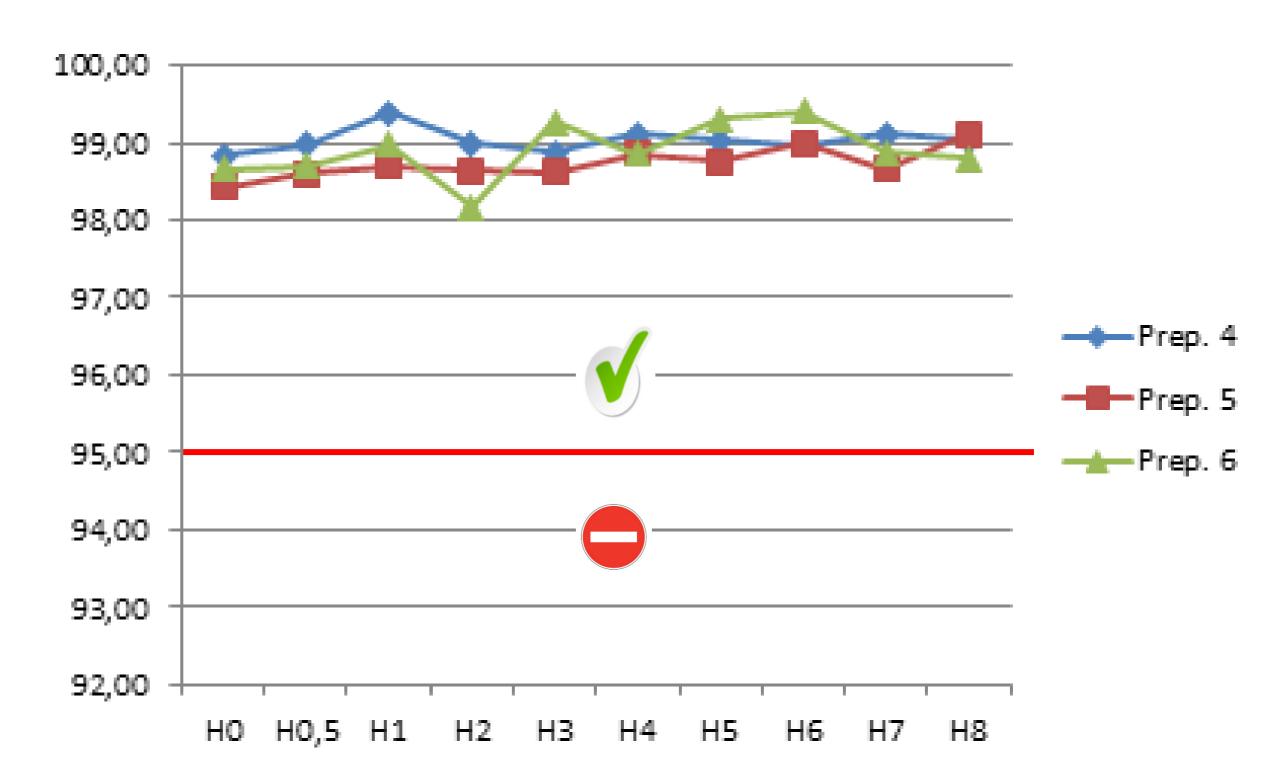
P1: 98.75% ± 0.10 et 99.15% ± 0.32

P2:98.60% ± 0.41 et 99.12% ± 0.24









Protocol P2 (dilution 1/5): mean RPC (%) at each time

Discussion

This study validated our ^{99m}Tc-MAA preparation protocols for pediatric use.

Protocol P1 (dilution ½): mean RPC (%) at each time

The protocols do not follow manufacturer's instructions but do fulfill EANM guidelines.

For some teams, however, questions remain about the need to adapt the number of injected MAA for children after the age of 2 as studies have shown that lung maturation ends between the age of 2 and 8.

Conclusion

Removing a portion of MAA before adding 99mTc does not alter 99mTc-MAA labelling efficiency. These protocols can be used to put in practice current EANM guidelines.