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Lectura recomendada

The synthesis, magnetic purification and evaluation of ^{99m}Tc -labeled microbubbles

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Introduction

Ultrasound (US) contrast agents based on microbubbles (MBs) are being investigated as platforms for drug and gene delivery. A methodology for determining the distribution and fate of modified MBs quantitatively in vivo can be achieved by tagging MBs directly with ^{99m}Tc . This creates the opportunity to employ dual-modality imaging using both US and small animal SPECT along with quantitative ex vivo tissue counting to evaluate novel MB constructs.

Methods

A ^{99m}Tc -labeled biotin derivative ($^{99m}\text{TcL1}$) was prepared and incubated with streptavidin-coated MBs. The ^{99m}Tc -labeled bubbles were isolated using a streptavidin-coated magnetic-bead purification strategy that did not disrupt the MBs. A small animal scintigraphic/CT imaging study as well as a quantitative biodistribution study was completed using $^{99m}\text{TcL1}$ and ^{99m}Tc -labeled bubbles in healthy C57Bl-6 mice.

Results

The imaging and biodistribution data showed rapid accumulation and retention of ^{99m}Tc -MBs in the liver (68.2 ± 6.6 %ID/g at 4 min; 93.3 ± 3.2 %ID/g at 60 min) and spleen (214.2 ± 19.7 %ID/g at 4 min; 213.4 ± 19.7 %ID/g at 60 min). In contrast, $^{99m}\text{TcL1}$ accumulated in multiple organs including the small intestine (22.5 ± 3.6 %ID/g at 4 min; 83.4 ± 5.9 %ID/g at 60 min) and bladder (184.0 ± 88.1 %ID/g at 4 min; 24.2 ± 17.7 %ID/g at 60 min).

Conclusion

A convenient means to radiolabel and purify MBs was developed and the distribution of the labeled products determined. The result is a platform which can be used to assess the pharmacokinetics and fate of novel MB constructs both regionally using US and throughout the entire subject in a quantitative manner by employing small animal SPECT and tissue counting.



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