Electronic Supplementary Material (ESI) for Dalton Transactions.

Technetium-99m and rhenium-188 complexes with one and two pendant bisphosphonate groups for imaging arterial calcification

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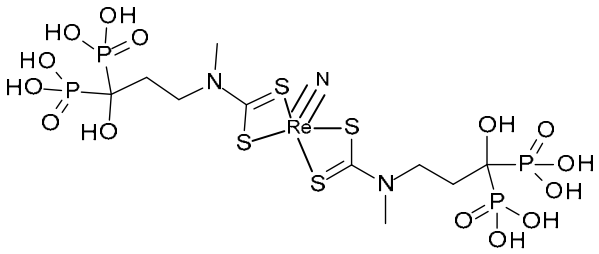
Supplemental Information

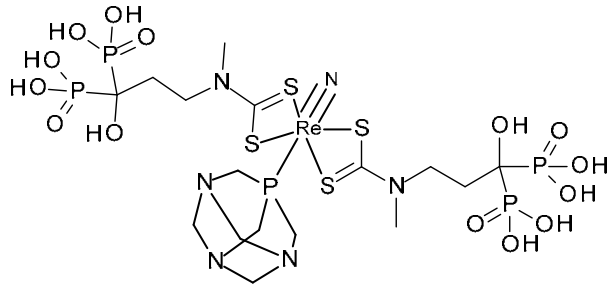
Mass spectrometry data: Table of values for rhenium species.

Voltage	Formula	Estimated Species	m/z (Calculated)	m/z (Found)	intensity	Potential structure
325	$C_{10}H_{24}N_3O_{14}P_4S_4[^{185}Re]$	$(M-H)^-$	845.8548	845.8705		8 $ReN(DTC\text{-}BP)_2$
		$(M-2H+Na)^-$	867.8368	867.8520		8 $ReN(DTC\text{-}BP)_2$
		$(M-3H+2Na)^-$	889.8187	889.8345		8 $ReN(DTC\text{-}BP)_2$
325	$C_{10}H_{24}N_3O_{14}P_4S_4[^{187}Re]$	$(M-H)^-$	847.8576	847.8721	1.05e4	8 $ReN(DTC\text{-}BP)_2$
		$(M-2H+Na)^-$	869.8396	869.8517		8 $ReN(DTC\text{-}BP)_2$
		$(M-3H+2Na)^-$	891.8215	891.8341		8 $ReN(DTC\text{-}BP)_2$
125	$C_{10}H_{24}N_3O_{14}P_4S_4[^{185}Re]$	$(M-2H)^{2-}$	422.4238	422.4115		8 $ReN(DTC\text{-}BP)_2$
		$(M-3H+Na)^{2-}$	433.4148	433.4037		8 $ReN(DTC\text{-}BP)_2$
		$(M-4H+2Na)^{2-}$	444.4057	444.3914		8 $ReN(DTC\text{-}BP)_2$
125	$C_{10}H_{24}N_3O_{14}P_4S_4[^{187}Re]$	$(M-2H)^{2-}$	423.4252	423.4129	2.1e4	8 $ReN(DTC\text{-}BP)_2$
		$(M-3H+Na)^{2-}$	434.4161	434.4033		8 $ReN(DTC\text{-}BP)_2$
		$(M-4H+2Na)^{2-}$	445.4071	445.3949		8 $ReN(DTC\text{-}BP)_2$
125	$C_{16}H_{36}N_6O_{14}P_5S_4[^{185}Re]$	$(M-H)^-$	1002.9317	1002.8885		9 $ReN(DTC\text{-}BP)_2(PTA)$
		$(M-2H+Na)^-$	1024.9137	1024.8689		9 $ReN(DTC\text{-}BP)_2(PTA)$
		$(M-3H+2Na)^-$	1046.8956	1046.8472		9 $ReN(DTC\text{-}BP)_2(PTA)$
125	$C_{16}H_{36}N_6O_{14}P_5S_4[^{187}Re]$	$(M-H)^-$	1004.9345	1004.8907	8e3	9 $ReN(DTC\text{-}BP)_2(PTA)$
		$(M-2H+Na)^-$	1026.9165	1026.8724		9 $ReN(DTC\text{-}BP)_2(PTA)$
		$(M-3H+2Na)^-$	1048.8984	1048.8549		9 $ReN(DTC\text{-}BP)_2(PTA)$
125	$C_{16}H_{36}N_6O_{14}P_5S_4[^{185}Re]$	$(M-2H)^{2-}$	500.9622	500.9456		9 $ReN(DTC\text{-}BP)_2(PTA)$
		$(M-3H+Na)^{2-}$	511.9532	511.9358		9 $ReN(DTC\text{-}BP)_2(PTA)$
		$(M-4H+2Na)^{2-}$	522.9442	522.9283		9 $ReN(DTC\text{-}BP)_2(PTA)$
125	$C_{16}H_{36}N_6O_{14}P_5S_4[^{187}Re]$	$(M-2H)^{2-}$	501.9636	501.9477	?	9 $ReN(DTC\text{-}BP)_2(PTA)$
		$(M-3H+Na)^{2-}$	512.9546	512.9398		9 $ReN(DTC\text{-}BP)_2(PTA)$
		$(M-4H+2Na)^{2-}$	523.9456	523.9248		9 $ReN(DTC\text{-}BP)_2(PTA)$
125	$C_{15}H_{36}N_4O_{21}P_6S_6[^{185}Re]$	$(M-H)^-$	1169.8079	1169.8819		10 $ReN(DTC\text{-}BP)_3$
125	$C_{15}H_{36}N_4O_{21}P_6S_6[^{187}Re]$	$(M-H)^-$	1171.8107	1171.8859	1.7e4	10 $ReN(DTC\text{-}BP)_3$

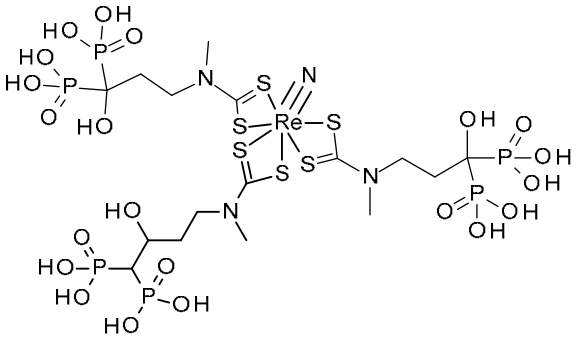
Table S1. Full mass spectrometry results of Re complexes.



8 ReN(DTC-BP)$_2$



11 ReN(DTC-BP)2(PTA)



12 ReN(DTC-BP)$_3$

Figure S1. Indicated structures from mass spectrometry results.

At 125V:

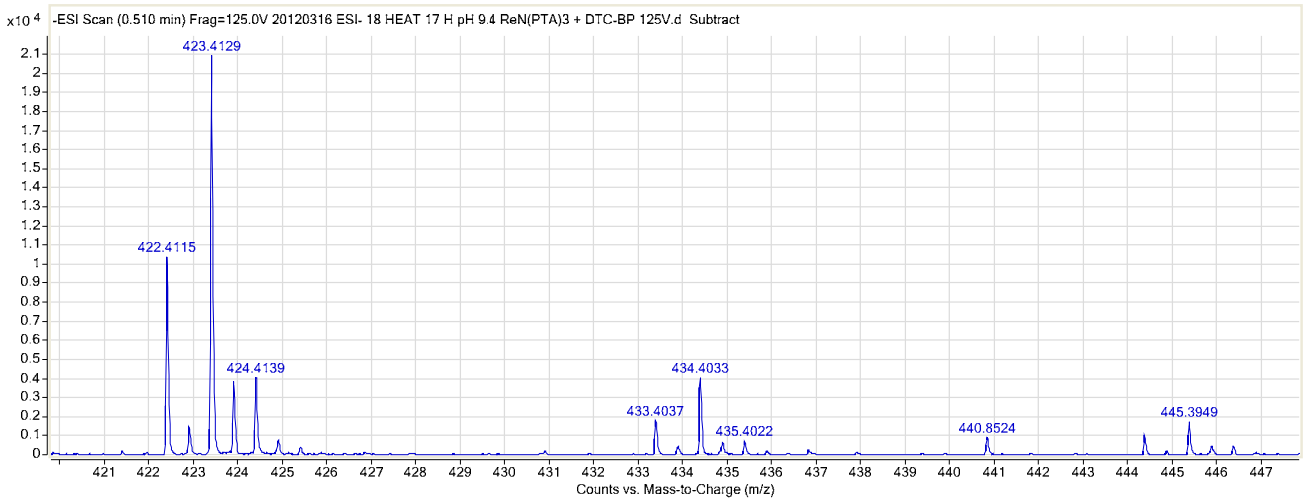


Figure S2. Indicates **6** [ReN(DTC-BP)$_2$] $(M-2H)^{2-}$ and sodium adducts at 125V.

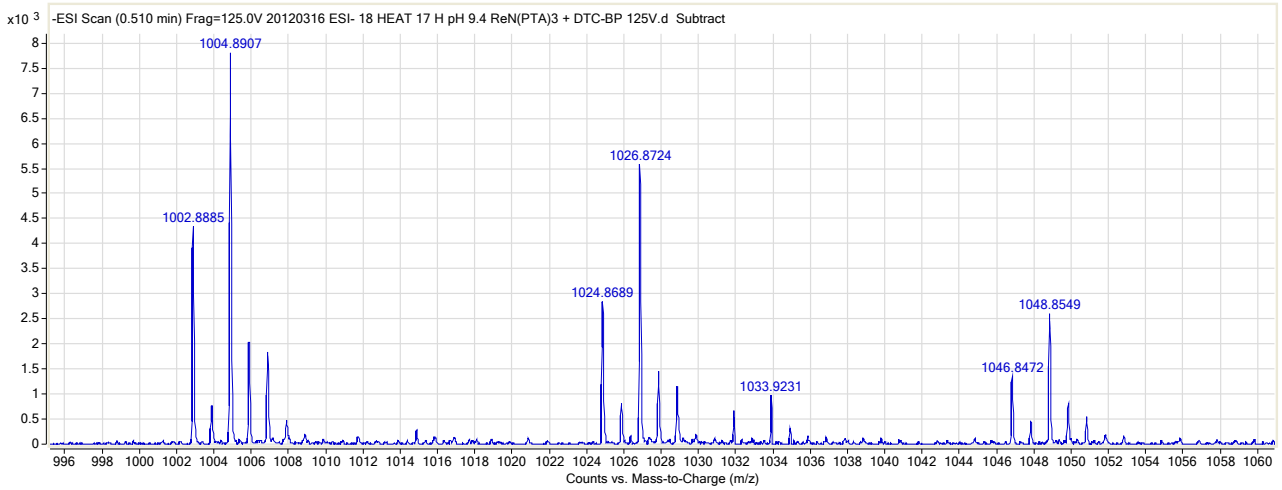


Figure S3. Indicates **9** [ReN(DTC-BP)$_2$(PTA)] (M-H)$^-$ and sodium adducts at 125V.

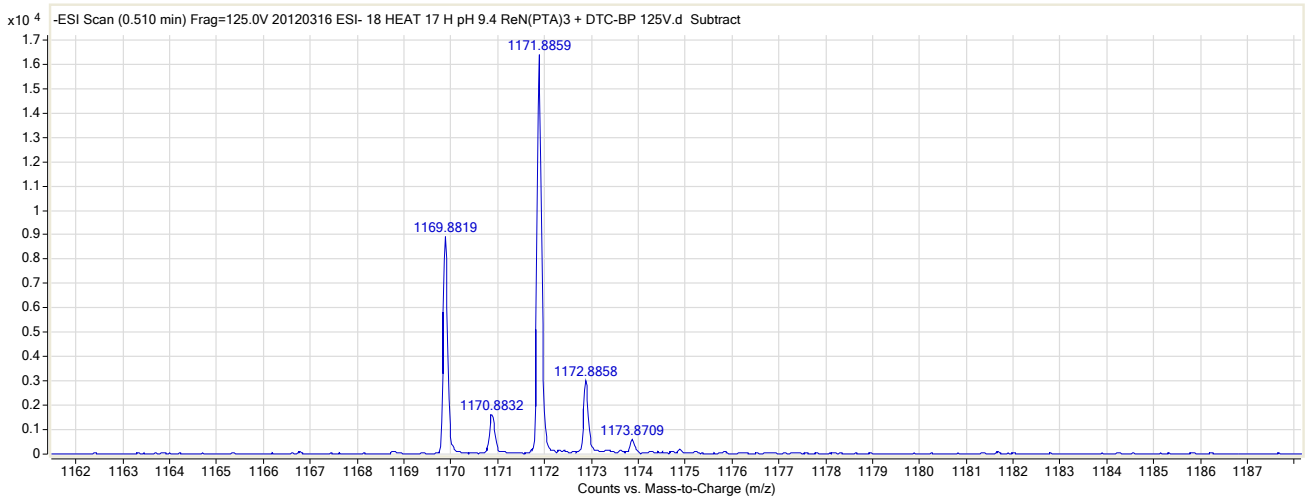


Figure S4. Indicates **10** [ReN(DTC-BP)$_3$] (M-H)$^-$ at 125V.

At 325V.

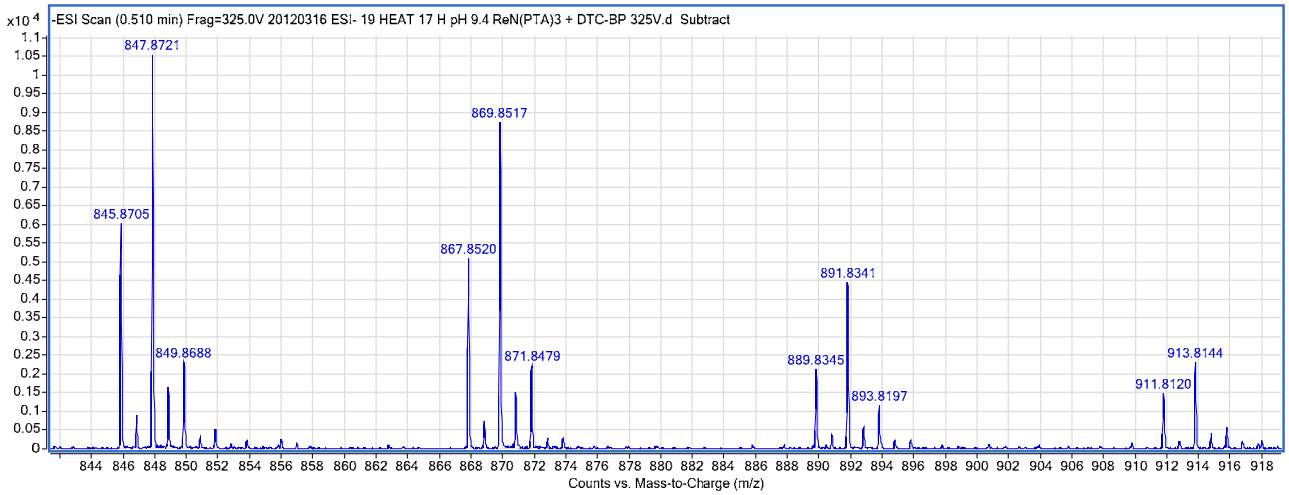


Figure S5. Indicates Re-**6** [ReN(DTC-BP)$_2$] (M-H)$^-$ and sodium adducts at 325V.

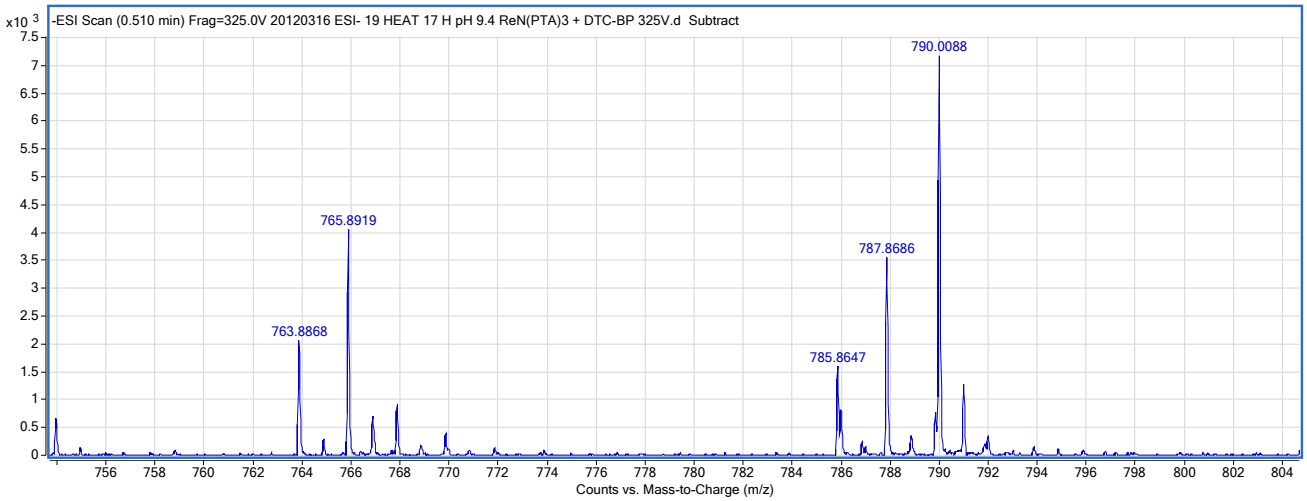


Figure S6. Unknown rhenium containing species and weak abundance potential sodium adduct at 325V.

Table of values for ^{99}Tc data

Voltage	Formula	Estimated Species	m/z (Calculated)	m/z (Found)	Error (ppm)	Potential structure
250	$C_{10}H_{24}N_3O_{14}P_4S_4[^{99}Tc]$	$(M-H)^-$	759.8082	759.8003	10.4	7 ^{99}TcN(DTC-BP)$_2$
		$(M-2H+Na)^-$	781.7901	781.7815	11.0	7 ^{99}TcN(DTC-BP)$_2$
		$(M-3H+2Na)^-$	803.7721	803.7624	12.1	7 ^{99}TcN(DTC-BP)$_2$
175	$C_{10}H_{24}N_3O_{14}P_4S_4[^{99}Tc]$	$(M-2H)^{2-}$	379.4005	379.3972	8.7	7 ^{99}TcN(DTC-BP)$_2$
		$(M-H)^-$	759.8082	759.8008	9.7	7 ^{99}TcN(DTC-BP)$_2$
		$(M-2H+Na)^-$	781.7901	781.7824	9.9	7 ^{99}TcN(DTC-BP)$_2$

Table S2. Mass spectrometry results of 99Tc complex.

Spectra:

At 250V:

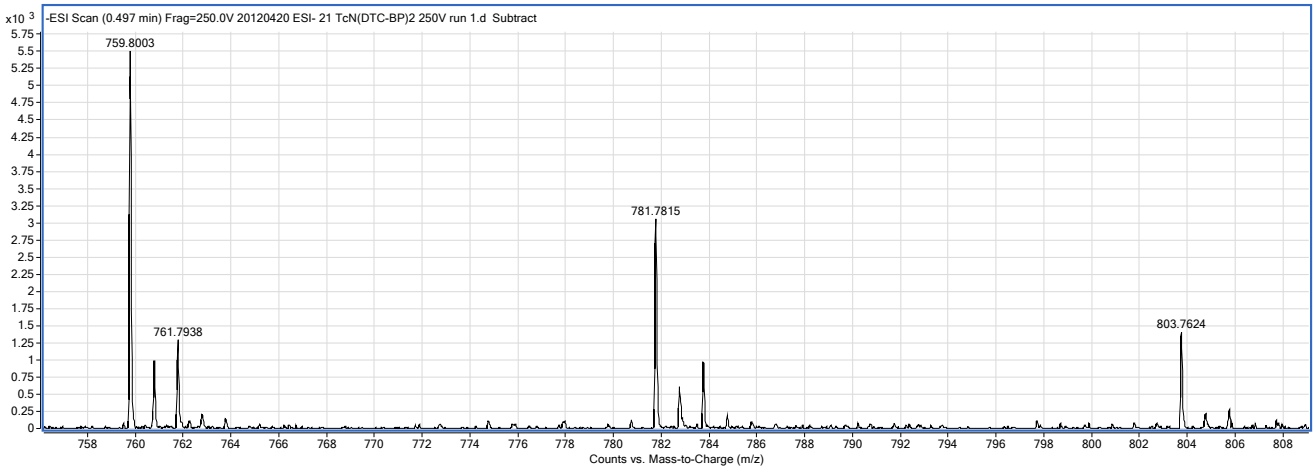
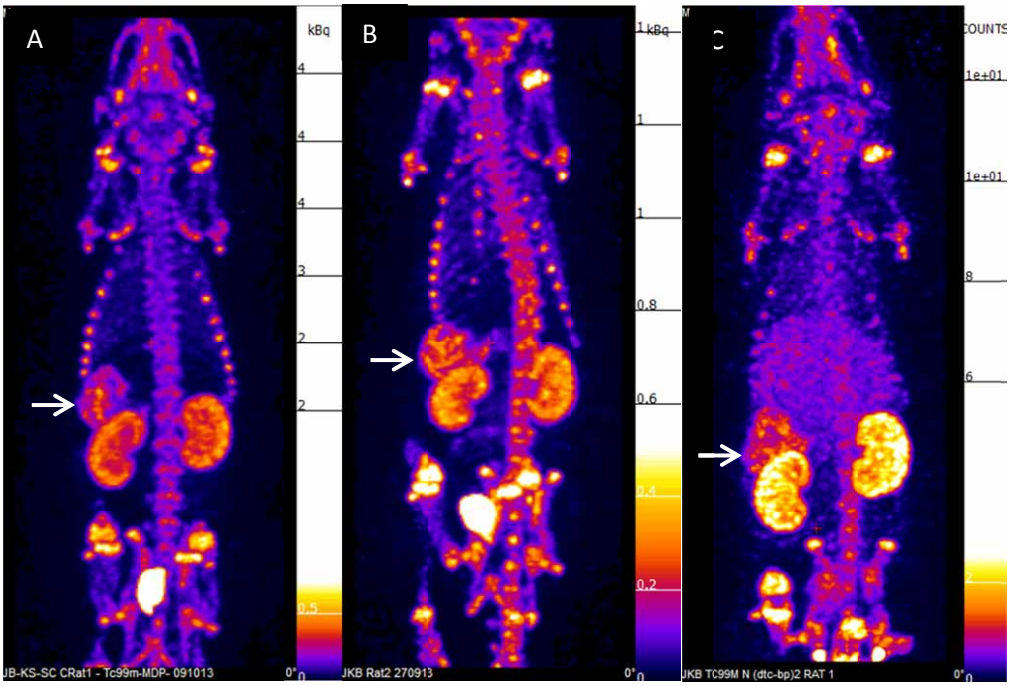


Figure S7. Indicates ^{99}Tc-**6** $(M-H)^-$ and sodium adduct.

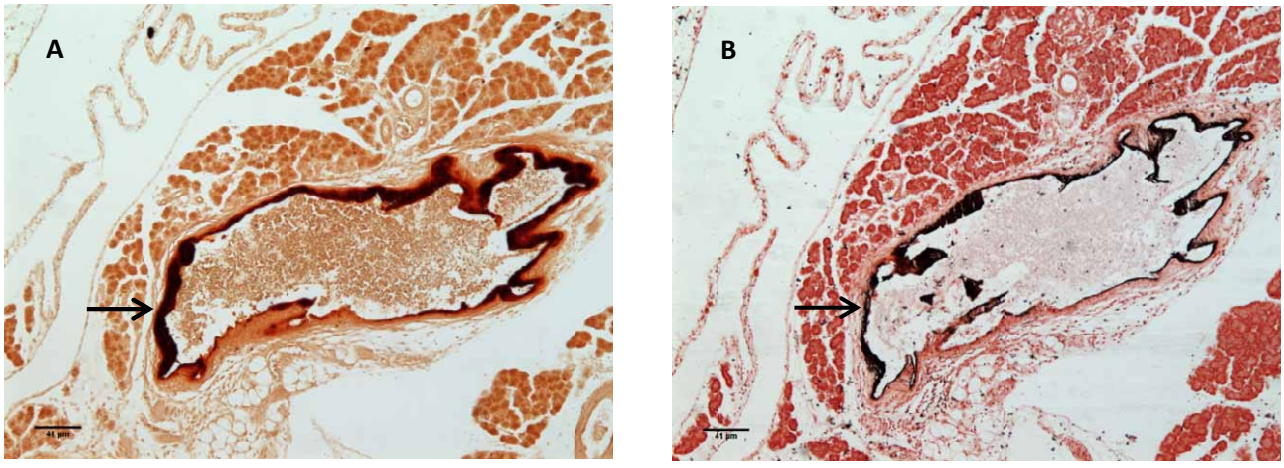
***In vivo* imaging with calcified rat model**



3 and (C)
lly joints

Histology

Tissues excised from rats sacrificed (by over dose of anaesthesia) after SPECT-CT scan were treated with 4% formaldehyde for 4 hours. The tissues were then transferred to 70% ethanol, processed in an automated tissue processor (Shandon Hypercenter XP) and embedded in paraffin. Sections (5 µm thick) were cut in a microtome and stained with Alizarin red S and Von-Kossa to detect the presence of calcification.



(alizarin red-

Figure S10: Biodistribution of ^{188}Re in mice (n = 3) 24 h after i.v. injection of [^{188}Re]-**8** (relative activity per gram of tissue)

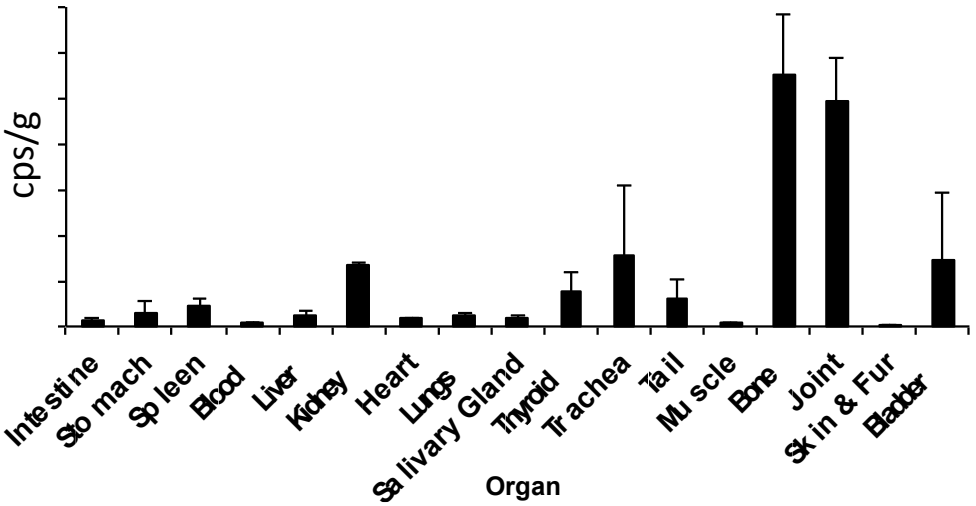
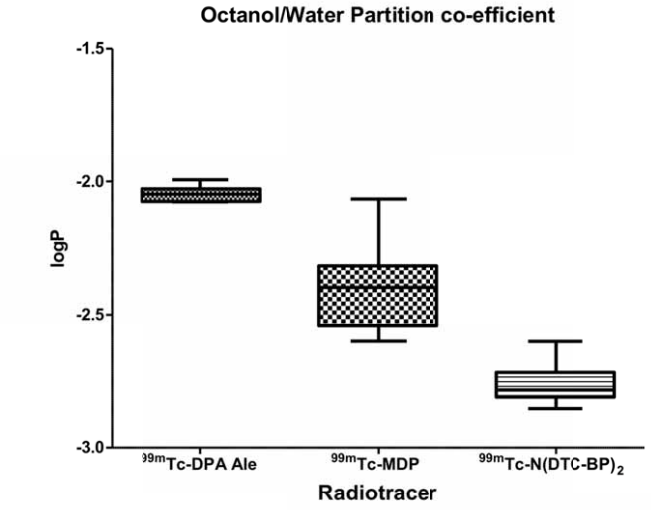


Figure S11: logP data for ^{99m}Tc-bisphoshonate derivatives



n=9	^{99m}Tc-DPA Ale	^{99m}Tc-MDP	^{99m}Tc-N(DTCBP)$_2$
Mean	-2.048	-2.397	-2.762
Std. Deviation	0.02825	0.1631	0.07612
Std. Error	0.009415	0.05435	0.02537