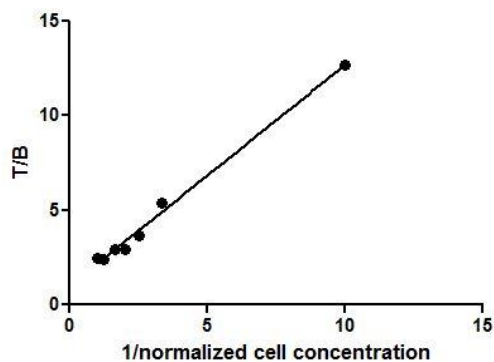
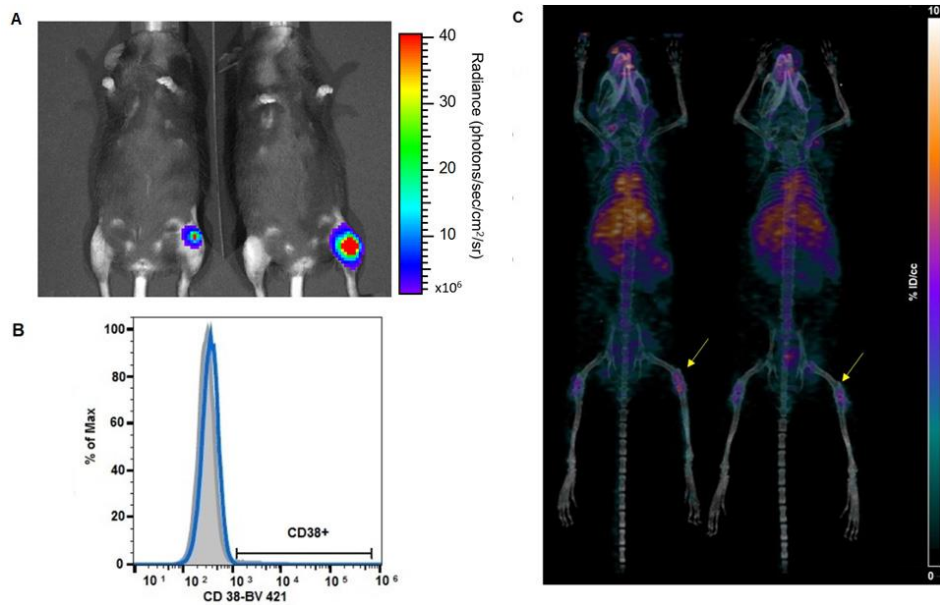


Supplemental Figure 1. (A) Representative bioluminescence image of a SCID mouse bearing s.c MM1.S tumor in the flank; (B) Flow cytometry was performed on the extracted tumor (from mouse shown in left) to demonstrate that high CD38 expression was retained on the MM1.S tumors *in vivo*.



Supplemental Figure 2. The immunoreactivity of [⁸⁹Zr]Zr-DFO-daratumumab was estimated by measuring the binding of a constant concentration of [⁸⁹Zr]Zr-DFO-daratumumab to increasing numbers of MM1.S MM cells. This is a double-inverse plot of a triplicate assay. T/B=Total Activity/Bound Activity



Supplemental Figure 3. Enhanced permeability and retention tumor noise control. (A) Bioluminescence images of the intra-tibial 5TGM1-GFP-*luc* (5TGM1) tumor bearing KaLwRij syngeneic mice; (B) Flow cytometry data showed less than 1% CD38-positive expression in murine 5TGM1 MM cells; (C) [⁸⁹Zr]Zr-DFO-daratumumab/PET/CT MIP images of the i.t. 5TGM1/KaLwRij mice at 7 days post injection of the radiopharmaceutical. [⁸⁹Zr]Zr-DFO-daratumumab was not-retained in the 5TGM1/KaLwRij mouse model.

ORGAN	% ID/g
Blood	11.34 ± 0.25
Lungs	7.14 ± 0.55
Liver	8.68 ± 0.92
Spleen	25.57 ± 3.39
Kidney	6.28 ± 0.64
Muscle	2.17 ± 0.15
Fat	1.45 ± 0.52
Heart	4.13 ± 0.34
Bone	7.93 ± 0.78
Adrenals	4.76 ± 0.54
Pancreas	2.02 ± 0.37
Stomach	0.93 ± 0.23
Sm intestine	1.65 ± 0.18
U large intestine	1.21 ± 0.15
L large intestine	1.13 ± 0.15

Supplemental Table 1: Tissue biodistribution of [⁸⁹Zr]Zr-DFO-daratumumab in non-tumor SCID mice (n=4) at 7 days post administration of the radiotracer.

Organs	[⁸⁹ Zr]Zr-DFO-daratumumab (%ID/g)	[⁸⁹ Zr]Zr-DFO-daratumumab+Block (%ID/g)
Blood	11.05 ± 1.38	12.19 ± 1.49
Lungs	8.58 ± 1.73	8.84 ± 0.10
Liver	9.16 ± 1.47	7.53 ± 2.16
Spleen	31.51 ± 6.10	10.57 ± 1.44
Kidney	7.06 ± 1.11	7.28 ± 2.23
Muscle	2.25 ± 0.32	2.54 ± 0.81
Fat	2.21 ± 0.99	1.71 ± 0.82
Heart	4.15 ± 0.35	4.23 ± 0.91
Bone	8.94 ± 0.68	5.54 ± 1.07
Adrenals	5.46 ± 2.96	4.73 ± 2.16
Pancreas	2.20 ± 0.30	2.16 ± 0.44
Stomach	1.53 ± 0.46	1.51 ± 0.44
Sm intestine	1.91 ± 0.28	1.85 ± 0.35
U large intestine	1.94 ± 0.55	1.89 ± 0.30
L large intestine	1.39 ± 0.44	1.74 ± 0.61
Tumor	27.7 ± 7.6	6.46 ± ND

Supplemental Table 2: Tissue biodistribution of [⁸⁹Zr]Zr-DFO-daratumumab in MM1.S tumor bearing SCID mice (n=3) at 7 d post administration of the radiotracer. A separate set of mice was co-injected with 200-fold excess of unlabeled daratumumab.