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☐ Initial submission ☐ Revised version ☒ Final submission

Life Sciences Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form is intended for publication with all accepted life science papers and provides structure for consistency and transparency in reporting. Every life science submission will use this form; some list items might not apply to an individual manuscript, but all fields must be completed for clarity.

For further information on the points included in this form, see Reporting Life Sciences Research. For further information on Nature Research policies, including our data availability policy, see Authors & Referees and the Editorial Policy Checklist.

Experimental design

1. Sample size

Describe how sample size was determined.

In animal experiments, sample sizes were chosen on the basis of previous experience with regard to variability in MM-xenograft models, and based on the principle of using the minimum number of animals to provide adequate statistical power.

2. Data exclusions

Describe any data exclusions.

No data was excluded.

3. Replication

Describe whether the experimental findings were reliably reproduced.

For all experiments, all attempts at replication were successful.

4. Randomization

Describe how samples/organisms/participants were allocated into experimental groups.

Mice were allocated into groups of equal average base line tumor burden prior to treatments.

5. Blinding

Describe whether the investigators were blinded to group allocation during data collection and/or analysis.

Blinded analysis was not performed in these studies.

Note: all studies involving animals and/or human research participants must disclose whether blinding and randomization were used.

6. Statistical parameters

For all figures and tables that use statistical methods, confirm that the following items are present in relevant figure legends (or in the Methods section if additional space is needed).

n/a	Confirmed
☐	☒ The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement (animals, litters, cultures, etc.)
☐	☒ A description of how samples were collected, noting whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☐	☒ A statement indicating how many times each experiment was replicated
☐	☒ The statistical test(s) used and whether they are one- or two-sided (note: only common tests should be described solely by name; more complex techniques should be described in the Methods section)
☐	☒ A description of any assumptions or corrections, such as an adjustment for multiple comparisons
☐	☒ The test results (e.g. *P* values) given as exact values whenever possible and with confidence intervals noted
☐	☒ A clear description of statistics including central tendency (e.g. median, mean) and variation (e.g. standard deviation, interquartile range)
☐	☒ Clearly defined error bars

See the web collection on statistics for biologists for further resources and guidance.

Nature Medicine: doi:10.1038/nm.4431

Software

Policy information about availability of computer code

7. Software

Describe the software used to analyze the data in this study.	JMP13.0.0 (SAS), Flow Jo v9.7.7 (FlowJo LLC)

For manuscripts utilizing custom algorithms or software that are central to the paper but not yet described in the published literature, software must be made available to editors and reviewers upon request. We strongly encourage code deposition in a community repository (e.g. GitHub). *Nature Methods* guidance for providing algorithms and software for publication provides further information on this topic.

Materials and reagents

Policy information about availability of materials

8. Materials availability

Indicate whether there are restrictions on availability of unique materials or if these materials are only available for distribution by a for-profit company.	All unique materials used in this study are available from the corresponding author upon reasonable request.

9. Antibodies

Describe the antibodies used and how they were validated for use in the system under study (i.e. assay and species).	CD38-FITC (HIT2, eBioscience), CD138-APC (MI15, Bio Legend, San Diego, CA, USA), CD45-Cy7PE (HI30, Bio Legend), mouse CD45-Cy7PE (30-F11, BioLegend), CD3-Cy7PE (UCHT1, BioLegend), CD19-Cy7APC (HIB19, BioLegend), CD14-FITC (M5E2, BioLegend), CD56-FITC (MEM188, eBioscience), CD16-FITC (3G8, BioLegend), CD235-Cy5PE (HIR2, BioLegend), CD41-FITC (HIP8, BioLegend), CD45RA-FITC (JS-83, eBioscience), CCR7-Cy7PE (G043H7, BioLegend), CD34-APC (561, BioLegend), anti-b7 integrin (FIB27, BioLegend), anti-a4 integrin-APC (9F10, BioLegend), anti-aE integrin-APC (Ber-ACT8, BioLegend), anti-BCMA (19F2, BioLegend), MMG49 (established by our lab), goat anti-mouse IgG-PE (#405307, BioLegend), and goat anti-rat IgG-PE (#405406, BioLegend). validated by flowcytometry anti-integrin b7 antibody (EP5948, Abcam) validated by western blot anti-a4 integrin, HP2/1 (#ab22858, Abcam), anti-b7 integrin, BP6 (#sc-53357, Santa Cruz Biotechnology), anti-b1 integrin, TS2/16 (purified from the hybridoma culture supernatants), anti-a4b7 integrinAct-1 (provided by NIH AIDS Reagents program) validated by EISA

10. Eukaryotic cell lines

a. State the source of each eukaryotic cell line used.	MM.1S, U266, and HuT78 cells were purchased from ATCC. K562, RPMI8226, KMS12BM, Molt4, and Daudi cells were purchased from the Japanese Collection of Research Bioresources Cell Bank. OPM2 and JJN3 cells were kind gifts from Dr. Yuzuru Kanakura (Osaka University, Japan). INA-6 cells were kind gifts from Dr. Renate Burger (University of Kiel, Kiel, Germany). SP2/0 mouse myeloma cells were a kind gift from Dr. Irving Weissman (Stanford University).
b. Describe the method of cell line authentication used.	Authentication of cell lines was not performed by the authors.
c. Report whether the cell lines were tested for mycoplasma contamination.	Cell lines were confirmed to be mycoplasma-free.
d. If any of the cell lines used are listed in the database of commonly misidentified cell lines maintained by ICLAC, provide a scientific rationale for their use.	No commonly misidentified cell lines were used.

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Animals and human research participants

Policy information about studies involving animals; when reporting animal research, follow the ARRIVE guidelines

11. Description of research animals

Provide details on animals and/or animal-derived materials used in the study.

Six- to eight-week-old female NOD/SCID/IL2Rgammac-/- (NOG) mice obtained from Center for Experimental Animal (Kawasaki, Japan) were used in this study.

Policy information about studies involving human research participants

12. Description of human research participants

Describe the covariate-relevant population characteristics of the human research participants.

BM cells from MM patients or healthy donors were collected from the iliac bone. The study was approved by the institutional review boards of Osaka University School of Medicine, Fuchu Hospital, Osaka City General Hospital, Osaka General Hospital of Japan Railway West Company, and Kinki Cord Blood Bank. All samples were collected after informed consent was obtained.

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