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Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Research policies, see our Editorial Policies and the Editorial Policy Checklist.

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a	Confirmed	
☐	☒	The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement
☒	☐	A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☒	☐	The statistical test(s) used AND whether they are one- or two-sided *Only common tests should be described solely by name; describe more complex techniques in the Methods section.*
☒	☐	A description of all covariates tested
☒	☐	A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
☒	☐	A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
☒	☐	For null hypothesis testing, the test statistic (e.g. *F*, *t*, *r*) with confidence intervals, effect sizes, degrees of freedom and *P* value noted *Give P values as exact values whenever suitable.*
☒	☐	For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
☒	☐	For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
☒	☐	Estimates of effect sizes (e.g. Cohen's *d*, Pearson's *r*), indicating how they were calculated

Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	Confocal software: LAS AF v. 2.7.4. and multiphoton software: LAS X. v.3.1.5.
Data analysis	Bitplane Imaris (v.9.2).

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research guidelines for submitting code & software for further information.

Data

Policy information about availability of data

All manuscripts must include a data availability statement. This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

Examples of the primary datasets underlying all data Figures and Supplementary Videos presented in this article can be found on 10.5281/zenodo.3843094.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☒ Life sciences ☐ Behavioural & social sciences ☐ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Life sciences study design

All studies must disclose on these points even when the disclosure is negative.

Sample size	Sample sizes of experiments were chosen based on prior research conducted in our laboratories.
Data exclusions	Prior to the collection of ex vivo imaging data, we first established the optimal time window for imaging skin-Trm cell migration (see PMID: 31110315). When imaging murine ex vivo tissue directly after harvest and mounting, skin-Trm cells exhibited a higher circularity and were relatively immobile, but cells regained motility and dendricity overnight (see also Supplementary Video 1). Histopathological analysis showed that skin conditions deteriorate over time, with mild alterations in the first 24 h but signs of severe skin degeneration apparent at 72 h (PMID: 31110315: Supplementary Fig. 2d, top). For these reasons, all ex vivo experiments were performed after an overnight recovery period, but no later than 24 h.
Replication	The number of experiments performed, in all cases supporting the data reported, are stated in the figure legends.
Randomization	Murine and human tissues were randomly assigned to experimental conditions.
Blinding	Blinding was not performed.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☐	☒ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☐	☒ Animals and other organisms
☐	☒ Human research participants
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Antibodies

Antibodies used	Antibodies: - anti-human CD1a-AF488 (clone HI149, cat. #: 300114, BioLegend, dilution: 4-8 ug/ml, RRID: AB_493104) (validated by manufacturer on: human lymphoblastic leukemia cell line; validated applications: FC; reported applications: IHC-Fr) - anti-human CD103-AF488 (clone Ber-ACT8, cat. #: 350208, BioLegend, final concentration: 5-10 ug/ml, RRID: AB_10641844) (validated by manufacturer on: stimulated human PBMCs; validated applications: WB, IP, IHC-Fr) - anti-human collagen type IV-AF488 (clone 1042, cat. #: 53-9871-82, Thermo Fisher Scientific, final concentration: 6.25-12.5 ug/ml, RRID: AB_2574487) (validated by manufacturer on: human tissue sections; validated applications: IHC-P; reported applications: IHC-Fr) Nanobodies: - anti-mCD8-AF594 (clone 118; dilution ex vivo skin: 5-10 ug/ml final) - anti-hCD8-AF594 (clone 218; dilution ex vivo skin: 5-10 ug/ml final) For details on production of AF594-labeled nanobodies, see 'Box1'. Abbreviations: FC (flow cytometry), IHC-Fr (immunohistochemistry, frozen sections), WB (western blot), IP (immunoprecipitation) and IHC-P (immunohistochemistry, formalin/PFA-fixed paraffin-embedded sections).
Validation	All antibodies were validated for their application by the manufacturer (see above in 'Antibodies used' for details). a-mCD8 and a-hCD8 nanobody batches were validated on blood samples, using a-mCD8 on human samples or a-hCD8 on murine samples as irrelevant controls. Antibody stainings for ex vivo human skin samples were titrated per individual.

Animals and other organisms

Policy information about studies involving animals; ARRIVE guidelines recommended for reporting animal research

Laboratory animals	C57BL/6j-Ly5.1, C57BL/6j OT-I and C57BL/6j UCB-GFP females and males of 8-25 weeks at time of experimentation were used.
Wild animals	The study did not involve wild animals.
Field-collected samples	The study did not involve samples collected from the field.
Ethics oversight	All animals were maintained and bred in the animal department of The Netherlands Cancer Institute (NKI). All animal experiments were approved by the Animal Welfare Committee (NKI, the Netherlands), in accordance with national guidelines.

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Human research participants

Policy information about studies involving human research participants

Population characteristics	Human skin samples in this study were collected during abdominoplastic and breast reconstructing surgery.
Recruitment	No patients were specifically recruited for this study. Human samples were taken from skin material obtained during planned surgeries.
Ethics oversight	In accordance with national guidelines, informed consent is not required for use of this material. Patient characteristics cannot be coupled to these samples.

Note that full information on the approval of the study protocol must also be provided in the manuscript.