



Universiteit
Leiden
The Netherlands

The diverse roles of integrin $\alpha 3 \beta 1$ in cancer: Lessons learned from skin and breast carcinogenesis

Ramovš, V.

Citation

Ramovš, V. (2021, February 18). *The diverse roles of integrin $\alpha 3 \beta 1$ in cancer: Lessons learned from skin and breast carcinogenesis*. Retrieved from <https://hdl.handle.net/1887/3135050>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/3135050>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/3135050> holds various files of this Leiden University dissertation.

Author: Ramovš, V.

Title: The diverse roles of integrin $\alpha\beta1$ in cancer: Lessons learned from skin and breast carcinogenesis

Issue date: 2021-02-18

THE DIVERSE ROLES OF INTEGRIN $\alpha 3 \beta 1$ IN CANCER

lessons learned from skin and breast carcinogenesis

Veronika Ramovš

THE DIVERSE ROLES OF INTEGRIN $\alpha 3 \beta 1$ IN CANCER

ISBN/EAN: 978-94-6421-202-0
Layout and design by: Marilou Maes, persoonlijkproefschrift.nl
Printed by: Ipskamp Printing | proefschriften.net
Cover: My PhD. Drawing and design by Veronika Ramovš

From the perspective of the researcher, the role of $\alpha 3 \beta 1$ in cancer depends on “time” and “place”; the stage and the type of cancer investigated. Thus, conducting such research sometimes feels like being dropped in the middle of a maze - depending on the first turn you take, you might end up following different paths. Adding a few dead ends, it is also a somewhat appropriate metaphor for the progression of my PhD. At least sometimes.

Copyright © 2021 Veronika Ramovš

All rights reserved. No part of this thesis may be reproduced, stored or transmitted in any way or by any means without the prior permission of the author, or when applicable, of the publishers of the scientific papers.

THE DIVERSE ROLES OF INTEGRIN $\alpha 3 \beta 1$ IN CANCER

lessons learned from skin and breast carcinogenesis

Proefschrift

ter verkrijging van de graad van Doctor aan de Universiteit Leiden
op gezag van de Rector Magnificus, Prof.dr.ir. H. Bijl,
volgens besluit van het College voor Promoties
te verdedigen op donderdag 18 februari 2021 klokke 16.15 uur

door

Veronika Ramovš

geboren op 30 mei 1988 te Ljubljana, Slovenië

Promotor

Prof. Dr. Arnoud Sonnenberg
Netherlands Cancer Institute
Leiden University

Promotion committee

Prof. Dr. H. Irth
Leiden University

Prof. Dr. J. A. Bouwstra
Leiden University

Prof. Dr. E. Danen
Leiden University

Prof. Dr. J. Neefjes
LUMC, Leiden University

Prof. Dr. J. van Rheenen
Netherlands Cancer Institute
UMC Utrecht, Utrecht University

Dr. K. Raymond
LUMC, Leiden University

TABLE OF CONTENTS

CHAPTER 1	Introduction and scope of the thesis	7
CHAPTER 2	The opposing roles of laminin-binding integrins in cancer	15
CHAPTER 3	Integrin $\alpha 3 \beta 1$ in hair bulge stem cells modulates CCN2 expression and promotes skin tumorigenesis	71
CHAPTER 4	Integrin $\alpha 3 \beta 1$ is a key regulator of several pro-tumorigenic pathways during skin carcinogenesis	107
CHAPTER 5	Absence of integrin $\alpha 3 \beta 1$ promotes the progression of HER2-driven breast cancer in vivo	135
CHAPTER 6	General discussion	167
APPENDICES	Summary	184
	Nederlandse samenvatting	186
	Curriculum Vitae	189
	List of publications	190
	Acknowledgements	191