

University of Groningen

Antibody-free LC-MS/MS protein analysis of TRAIL

Wilffert, Daniel

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:
2016

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Wilffert, D. (2016). *Antibody-free LC-MS/MS protein analysis of TRAIL*. [Thesis fully internal (DIV), University of Groningen]. Rijksuniversiteit Groningen.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Antibody-free LC-MS/MS protein analysis of TRAIL

Daniel Wilffert

Paranymphs: Dr. Kees Bronsema
Maaïke Tjooitink

The work described in this thesis was performed in the research group Analytical Biochemistry, Department of Pharmacy, Faculty of Mathematics and Natural Sciences, University of Groningen, and within the research institute GUIDE.

This research and printing of the thesis was financially supported by the Dutch Technology Foundation STW, which is part of the Netherlands Organisation for Scientific Research (NWO) and partly funded by the Ministry of Economic Affairs (grant 11056)



Further financial support was provided by PRA Health Sciences (Assen, the Netherlands), Spark Holland (Emmen, The Netherlands), Merck Sharp & Dohme (MSD, Oss, the Netherlands), TOSOH Bioscience (Stuttgart, Germany), Beckman Coulter Inc. (Indianapolis, United States) and Bionavis (Tampere, Finland) as part of this grant.

© D. Wilffert, 2015 all rights reserved.

Cover Image: Reprinted with permission from Analytical Chemistry, 85(22): 10754-60 (2013). Copyright (2013) American Chemical Society.

Printed by: Drukkerij Haveka bv, Alblasterdam

ISBN printed version: 978-90-367-8632-4

ISBN electronic version: 978-90-367-8631-7



rijksuniversiteit
 groningen

Antibody-free LC-MS/MS protein analysis of TRAIL

Proefschrift

ter verkrijging van de graad van doctor aan de
Rijksuniversiteit Groningen
op gezag van de
rector magnificus prof. dr. E. Sterken
en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op

Vrijdag 26 februari 2016 om 14.30 uur

door

Daniel Wilffert

geboren op 15 augustus 1984
te Biberach an der Riss, Duitsland

Promotores

Prof. dr. R.P.H. Bischoff
Prof. dr. N.C. van de Merbel
Prof. dr. W.J. Quax

Beoordelingscommissie

Prof. dr. H.W. Frijlink
Prof. dr. G.W. Somsen
Prof. dr. H. Schlüter

Table of contents

Chapter 1	Introduction and scope of the thesis	7
Chapter 2	Antibody-free workflows for protein quantification by LC-MS/MS	13
Chapter 3	Antibody-free LC-MS/MS quantification of rhTRAIL in human and mouse serum	51
Chapter 4	Highly sensitive antibody-free quantitation of rhTRAIL in serum using two-dimensional SPE and μ LC-MS/MS	73
Chapter 5	Quantitative antibody-free LC-MS/MS analysis of sTRAIL in sputum and saliva at the sub-ng/mL level	93
Chapter 6	Summary and future perspectives	111
Chapter 7	Nederlandse samenvatting en toekomstperspectieven	119
Chapter 8	Acknowledgements	127

