

University of Groningen

## Precision-cut tissue slices: a novel ex vivo model for fibrosis research

Pham, Bao Tung

**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):*

Pham, B. T. (2016). *Precision-cut tissue slices: a novel ex vivo model for fibrosis research*. [Groningen]: University of 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).

### 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.*

PRECISION-CUT TISSUE SLICES:  
A NOVEL EX VIVO MODEL FOR FIBROSIS RESEARCH

Bao Tung Pham

## **Paranimfen**

Dorenda Oosterhuis

Tobias van Haaften

The research presented in this PhD thesis was performed at the Department of Pharmaceutical Technology and Biopharmacy of the University of Groningen.

<b>Cover</b>	Jokohama
<b>Layout</b>	Jokohama
<b>Printed by</b>	Ipskamp Drukkers B. V.
<b>ISBN</b>	978-90-367-9275-9

© Bao Tung Pham, 2016

All right reserved. Copyright of the published articles is with the corresponding journal or otherwise with the author. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior permission in writing from the author or the copyright-owning journal



university of  
 groningen

# **Precision-cut tissue slices: a novel *ex vivo* model for fibrosis research**

**PhD thesis**

to obtain the degree of PhD at the  
University of Groningen  
on the authority of the  
Rector Magnificus Prof. E. Sterken  
and in accordance with  
the decision by the College of Deans.

This thesis will be defended in public on  
Friday 4<sup>th</sup> November 2016 at 11.00 hours

by

**Bao Tung Pham**

born on 22<sup>nd</sup> November 1982  
in Hanoi, Vietnam

**Supervisors:**

Prof. P. Olinga

Prof. H. W. Frijlink

**Co-supervisor:**

Dr. H.A.M. Mutsaers

**Assessment committee:**

Prof. R. A. Bank

Prof. G. Dijkstra

Prof. G. M. Thiele

*“Live as if you were to die tomorrow.  
Learn as if you were to live forever.”*

*Dedicated to my family, the only place I always find peace, unconditionally.*



## CONTENTS

<i>Chapter 1</i>	General introduction Adapted from: <i>Xenobiotica</i> 2013, 43(1), 98-112 and <i>Journal of Crohn's and Colitis</i> 2014, 8(10), 1166–1178	9
<i>Chapter 2</i>	Scope and aim of the thesis	39
<i>Chapter 3</i>	Precision-cut rat, mouse and human intestinal slices as novel models for the early-onset of intestinal fibrosis <i>Physiological Reports</i> 2015, 3(4), e12323–e12323	43
<i>Chapter 4</i>	Tetrandrine, pirfenidone, ly2109761 and sunitinib mitigate intestinal fibrosis in murine precision-cut intestinal slices <i>Submitted</i>	73
<i>Chapter 5</i>	Organ- and species-specific biological activity of rosmarinic acid <i>Toxicology in Vitro</i> 2016, 32, 261–268	97
<i>Chapter 6</i>	Precision-cut kidney slices (PCKS) to study development of renal fibrosis and efficacy of drug targeting <i>ex vivo</i> <i>Disease Models and Mechanisms</i> 2015, 8(10), 1227-1236	119
<i>Chapter 7</i>	General discussion and perspectives	147
<i>Appendix 1</i>	Nederlandse samenvatting	161
<i>Appendix 2</i>	Acknowledgement	167



