



Universiteit  
Leiden  
The Netherlands

## **Modeling vascular diseases using human induced pluripotent stem cells**

Cao, X.

### **Citation**

Cao, X. (2020, September 9). *Modeling vascular diseases using human induced pluripotent stem cells*. Retrieved from <https://hdl.handle.net/1887/136521>

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/1887/136521>

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

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/136521> holds various files of this Leiden University dissertation.

**Author:** Cao, X.

**Title:** Modeling vascular diseases using human induced pluripotent stem cells

**Issue Date:** 2020-09-09

# **Modeling Vascular Diseases Using Human Induced Pluripotent Stem Cells**

**Xu Cao**

**曹旭**

## **Colophon**

### **Modeling Vascular Diseases Using Human Induced Pluripotent Stem Cells**

PhD thesis

This thesis was prepared at the department of Anatomy and Embryology of the Leiden University Medical Center, Leiden, the Netherlands

Copyright © Xu Cao, Leiden, The Netherlands, 2020.

All rights reserved. No part of this book may be reproduced or transmitted, in any form or by any means, without permission in writing of the author. The copyright of the articles that have been published has been transferred to the respective journals.

The research in described in this thesis was supported by the European Research Council and a grant from Moller Foundation.

ISBN: 978-94-92597-43-4

Printed by Boekenddeal, The Netherlands.

Cover: Oil-red O staining of M1 macrophages derived from human induced pluripotent stem cells. The background image was granted by Pixabay (from Paul McManus)

<https://pixabay.com/zh/illustrations/fibres-fibers-fibre-fiber-organic-4113337/>.

# **Modeling Vascular Diseases Using Human Induced Pluripotent Stem Cells**

Proefschrift

Ter verkrijging van  
de graad van Doctor aan de Universiteit Leiden,  
op gezag van Rector Magnificus prof.mr. C.J.J.M. Stolker  
volgens besluit van het College voor Promoties  
te verdedigen op

woensdag 09 september 2020

klokke 10.00 uur

door

**Xu Cao**

geboren te Linyi, China in 1990

**Promotor:** Prof. dr. C. L. Mummery

**Co-promoter:** Dr. V. V. Orlova

**Promotiecommissie:**

Prof.dr. M.J.T.H. Goumans

Prof.dr. P.C.J.J. Passier

Dr. S. Semrau

Prof.dr. F.J.T. Staal

Prof. dr. D. Salvatori (Universiteit Utrecht)

# Table of Contents

## **Chapter 1**

**General Introduction..... - 7 -**

## **Chapter 2**

**Differentiation and Functional Comparison of Monocytes and Macrophages from hiPSCs with Peripheral Blood Derivatives..... - 45 -**

## **Chapter 3**

**Generation and Functional Characterization of Monocytes and Macrophages Derived from Human Induced Pluripotent Stem Cells ..... - 81 -**

## **Chapter 4**

**Transcriptional Dynamics During Segregation of Endothelial and Myocardial Lineages from Cardiac Mesoderm..... - 123 -**

## **Chapter 5**

**Vascular defects associated with Hereditary Hemorrhagic Telangiectasia revealed in patient-derived isogenic iPSCs..... - 155 -**

## **Chapter 6**

**Pseudomyogenic hemangioendothelioma recapitulated in endothelial cells from human induced pluripotent stem cells engineered to express the SERPINE1-FOSB translocation ..... - 191 -**

## **Appendix Chapter 6:**

**Follow up bioinformatics analysis of hiPSC-endothelial cells expressing the SERPINE1-FOSB translocation ..... - 224 -**

## **Chapter 7**

**Discussion and Future Perspectives..... - 233 -**

**APPENDIX..... - 250 -**

**SUMMARY..... - 252 -**

**SAMENVATTING..... - 254 -**

**CURRICULUM VITAE..... - 255 -**

**LIST OF PUBLICATIONS ..... - 249 -**

**ACKNOWLEDGMENTS ..... - 259 -**

