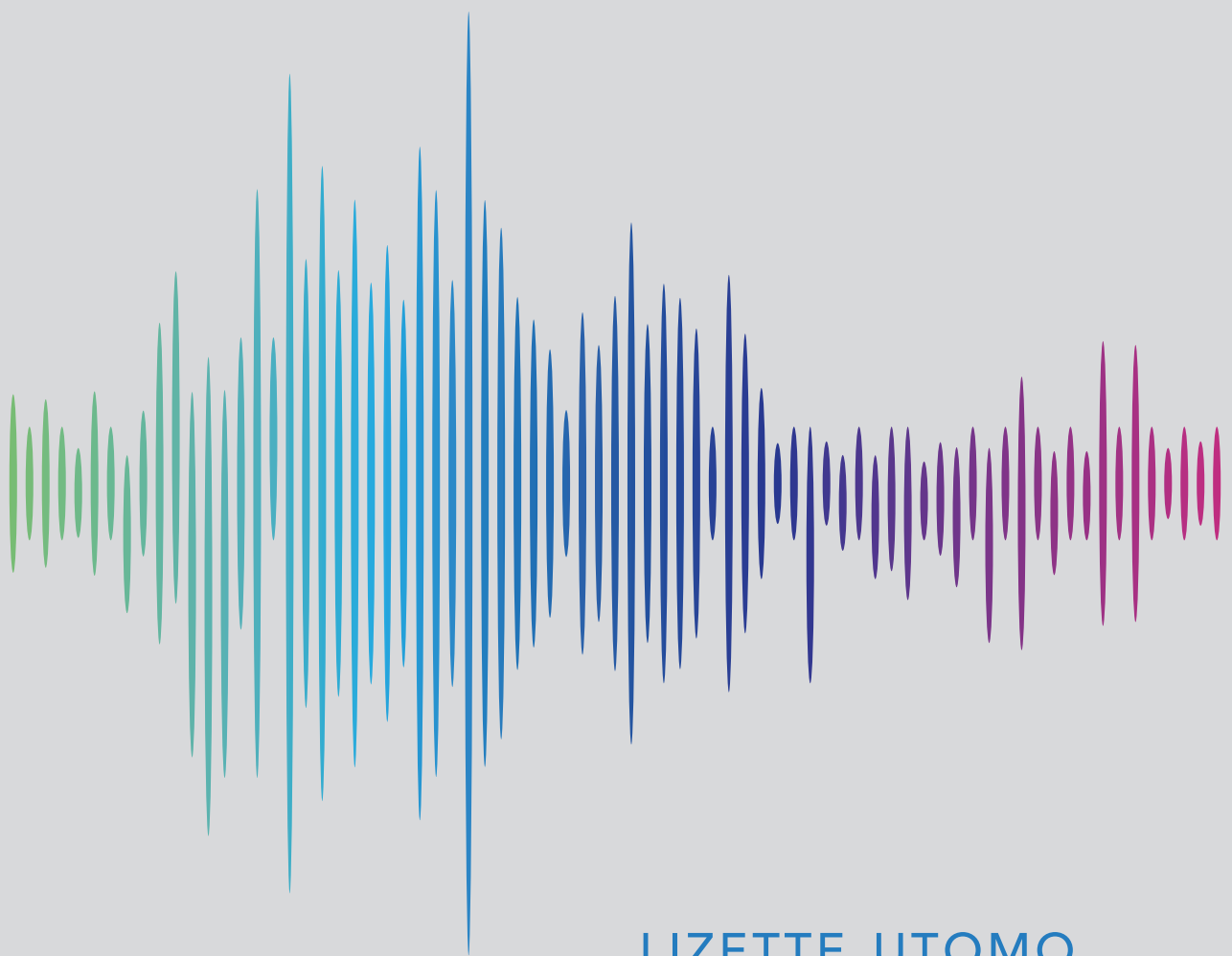


# Macrophage phenotypes in degenerative joint diseases



LIZETTE UTOMO

# **Macrophage Phenotypes in Degenerative Joint Diseases**

Lizette Utomo

## **Colofon**

Copyright © Lizette Utomo, the Netherlands, 2018.

ISBN: 978-94-6361-104-6

All rights reserved. No part of this thesis may be reproduced, distributed, stored in a retrieval system, or transmitted in any form or by any means, without the written permission of the author or, when appropriate, the publisher of the publications.

The work presented in this thesis was conducted at the Department of Orthopaedics, Erasmus MC University Medical Center Rotterdam, the Netherlands

Cover design: Lizette Utomo and Erwin Timmerman

Layout and printing: Optima Grafische Communicatie, Rotterdam, the Netherlands

Printing of this thesis was financially supported by:

Department of Orthopaedics, Erasmus MC University Medical Center Rotterdam

Erasmus University Rotterdam

Netherlands Society for Biomaterials and Tissue Engineering (NBTE)

Anna Fonds Leiden

# Macrophage Phenotypes in Degenerative Joint Diseases

Macrofaag fenotypen in degeneratieve gewrichtsaandoeningen

Proefschrift

ter verkrijging van de graad van doctor aan de  
Erasmus Universiteit Rotterdam  
op gezag van de  
rector magnificus

Prof.dr. R.C.M.E. Engels

en volgens besluit van het College voor Promoties.  
De openbare verdediging zal plaatsvinden op

Dinsdag 18 september 2018 om 13:30 uur

door

**Lizette Utomo**  
geboren te Rotterdam

**Erasmus University Rotterdam**

The logo of Erasmus University Rotterdam, featuring the word "Erasmus" in a stylized, cursive script.

## **PROMOTIECOMMISSIE**

Promotoren: Prof. dr. G.J.V.M. van Osch  
Prof. dr. J.A.N. Verhaar

Overige leden: Prof. dr. C.C. Baan  
Prof. dr. F.J. van Kemenade  
Dr. P.L.E.M. van Lent

Copromotor: Dr. Y.M. Bastiaansen-Jenniskens

## TABLE OF CONTENTS

<b>Chapter 1</b>	General introduction, thesis aim and outline	7
<b>Chapter 2</b>	Expression of <i>CCL2</i> in synovium is inversely correlated with articular cartilage degeneration in hip osteoarthritis patients	19
<b>Chapter 3</b>	Cartilage inflammation and degeneration is enhanced by pro-inflammatory (M1) macrophages <i>in vitro</i> , but not inhibited directly by anti-inflammatory (M2) macrophages	33
<b>Chapter 4</b>	Macrophage phenotypes profiles during the course of osteoarthritis and their association with osteoarthritis features in two mouse models	49
<b>Chapter 5</b>	Guiding synovial inflammation by macrophage phenotype modulation: an <i>in vitro</i> study towards a therapy for osteoarthritis	69
<b>Chapter 6</b>	Monocyte subsets in blood correlate with obesity related response of macrophages to biomaterials <i>in vitro</i>	93
<b>Chapter 7</b>	<i>In vitro</i> modulation of the behavior of adhering macrophages by medications is biomaterial-dependent	121
<b>Chapter 8</b>	General discussion	145
<b>Chapter 9</b>	Summary	157
<b>References</b>		163
<b>Appendices</b>		181
	Nederlandse samenvatting	183
	List of abbreviations	187
	List of publications	189
	Dankwoord	191
	PhD portfolio	195
	Curriculum vitae	199