



Universiteit  
Leiden  
The Netherlands

## Muscle MRI in Duchenne and Becker muscular dystrophy

Wokke, B.H.A.

### Citation

Wokke, B. H. A. (2015, September 9). *Muscle MRI in Duchenne and Becker muscular dystrophy*. Retrieved from <https://hdl.handle.net/1887/35124>

Version: Corrected 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/1887/35124>

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

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/35124> holds various files of this Leiden University dissertation.

**Author:** Wokke, Beatrijs Henriette Aleid

**Title:** Muscle MRI in Duchenne and Becker muscular dystrophy

**Issue Date:** 2015-09-09

# **Muscle MRI in Duchenne and Becker muscular dystrophy**

Beatrijs Wokke

## **Colophon**

PhD Thesis, Leiden University Medical Center, Leiden 2015

ISBN: 978-94-6299-137-8

Author: Beatrijs Wokke

Cover design: Bilbo Schickenberg

Layout: Ridderprint BV - [www.ridderprint.nl](http://www.ridderprint.nl)

Printed by: Ridderprint BV - [www.ridderprint.nl](http://www.ridderprint.nl)

Financial support for the publication of this thesis was kindly provided by Philips Healthcare Netherlands.

The work in this thesis was supported by het Prinses Beatrix Spierfonds en Association Française contre les Myopathies.

Copyright of the individual chapter lies with the publisher of the journal listed at the beginning of each chapter.

No part of this thesis may be reproduced, stored or transmitted in any form or by any means, without prior permission of the author.

# **Muscle MRI in Duchenne and Becker muscular dystrophy**

## **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 9 september 2015  
klokke 16.15 uur

door Beatrijs Henriëtte Aleid Wokke  
geboren te Haarlem in 1983

## **PROMOTIECOMMISSIE**

### **Promotor:**

Prof. dr. J.J.G.M. Verschuuren

### **Co-promotores:**

Dr. H.E. Kan

Dr. A.M Aartsma-Rus

### **Overige leden:**

Prof. dr. J.L. Bloem

Dr. E.H. Niks

Prof. dr. V. Straub (Newcastle University, Newcastle, United Kingdom)

*Lasciate ogni speranza, voi ch'intrate*  
*Divine Comedy, Dante Alighieri (1265-1321)*



## CONTENTS

|                   |   |     |
|-------------------|---|-----|
| <b>Chapter 1</b>  | General introduction  | 9   |
| <b>Chapter 2</b>  | Comparison of Dixon and T1-weighted MR methods to assess the degree of fatty infiltration in Duchenne muscular dystrophy patients<br><i>J.Magn Reson Imaging 2013 Sep 38 (3) 619-24</i> | 21  |
| <b>Chapter 3</b>  | Quantitative MRI and strength measurements in the assessment of muscle quality in Duchenne muscular dystrophy<br><i>Neuromusc Disord 2014 May 24 (5) 409-16</i>                         | 33  |
| <b>Chapter 4</b>  | Dystrophin levels and clinical severity in Becker muscular dystrophy patients<br><i>J. Neurol Neurosurg Psychiatry 2014 Jul 85 (7) 747-53</i>   | 47  |
| <b>Chapter 5</b>  | T2 relaxation times are increased in skeletal muscle of DMD but not BMD patients<br><i>Muscle Nerve 2015 Apr 6 doi:10.1002/musc.24679</i>   | 65  |
| <b>Chapter 6</b>  | Muscle spectroscopy detects elevated PDE/ATP ratios prior to fatty infiltration in Becker muscular dystrophy patients<br><i>NMR Biomed 2014 Nov 27 (11) 1371-7</i>                      | 77  |
| <b>Chapter 7</b>  | Discussion and conclusion   | 91  |
| <b>Chapter 8</b>  | Summary   | 97  |
|                   | Nederlandse samenvatting  | 101 |
| <b>Appendices</b> | References  | 107 |
|                   | List of abbreviations   | 123 |
|                   | List of publications  | 125 |
|                   | Curriculum vitae  | 129 |

