

University of Groningen

## Mutational and biochemical analysis of *Lactobacillus reuteri* glucansucrase enzymes

Meng, Xiangfeng

**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:*

2015

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

*Citation for published version (APA):*

Meng, X. (2015). *Mutational and biochemical analysis of Lactobacillus reuteri glucansucrase enzymes*. [Thesis fully internal (DIV), University of 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).

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.

**Mutational and biochemical analysis of  
*Lactobacillus reuteri* glucansucrase enzymes**

**Xiangfeng Meng**

Cover photo        Tjaard Pijning  
Cover design        Norden Soul ([www.nordensoul.com](http://www.nordensoul.com))  
Printed by           Ipskamp Drukkers, Enschede  
ISBN printed:        978-90-367-8344-6  
ISBN digital:         978-90-367-8345-3

The work described in this thesis was carried out in the Microbial Physiology Group of the Groningen Biomolecular Sciences and Biotechnology Institute in the University of Groningen and was financially supported by the China Scholarship Council and the University of Groningen.





university of  
groningen

# **Mutational and biochemical analysis of *Lactobacillus reuteri* glucansucrase enzymes**

**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  
Tuesday 8 December 2015 at 09.00 hours

by

**Xiangfeng Meng**

born on 8 April 1985  
in Shandong, China

**Supervisors**

Prof. L. Dijkhuizen

Prof. J.P. Kamerling

**Assessment Committee**

Prof. M.J.E.C. van der Maarel

Prof. D.B. Janssen

Prof. T. Desmet

# Contents

<b>Chapter 1</b>	General introduction: Tailor made $\alpha$ -glucans by GH70 glucansucrase enzymes	7
<b>Chapter 2</b>	Gluco-oligomers initially formed by the reuteransucrase enzyme of <i>Lactobacillus reuteri</i> 121 incubated with sucrose and malto-oligosaccharides	51
<b>Chapter 3</b>	Synthesis of oligo- and polysaccharides by <i>Lactobacillus reuteri</i> 121 reuteransucrase at high concentrations of sucrose	83
<b>Chapter 4</b>	Truncation of domain V of the multidomain glucansucrase GTF180 of <i>Lactobacillus reuteri</i> 180 heavily impairs its polysaccharide-synthesizing ability	105
<b>Chapter 5</b>	Residue L940 has a crucial role in the linkage and reaction specificity of the glucansucrase GTF180 of the probiotic bacterium <i>Lactobacillus reuteri</i> 180	125
<b>Chapter 6</b>	Characterization of the functional roles of amino acid residues in acceptor binding subsite +1 in the active site of the glucansucrase GTF180 of <i>Lactobacillus reuteri</i> 180	147
<b>Chapter 7</b>	Mutants targeting $\alpha$ -helix 4 residues at subsite +2 of the <i>Lactobacillus reuteri</i> 180 glucansucrase synthesize novel hyper-branched $\alpha$ -glucans from sucrose	171
<b>Chapter 8</b>	Summary and Prospects	197
<b>Samenvatting</b>		207
<b>中文摘要</b>		219
<b>References</b>		223
<b>Acknowledgements</b>		241

