

University of Groningen

Comprehensive characterization of *Escherichia coli* isolated from urine samples of hospitalized patients in Rio de Janeiro, Brazil

da Cruz Campos, Ana

DOI:
[10.33612/diss.111520622](https://doi.org/10.33612/diss.111520622)

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:
2020

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

Citation for published version (APA):
da Cruz Campos, A. (2020). *Comprehensive characterization of Escherichia coli isolated from urine samples of hospitalized patients in Rio de Janeiro, Brazil: the use of next generation sequencing technologies for resistance and virulence profiling and phylogenetic typing*. University of Groningen. <https://doi.org/10.33612/diss.111520622>

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.

**Comprehensive characterization of
Escherichia coli isolated from urine
samples of hospitalized patients in
Rio de Janeiro, Brazil**

*The use of next generation sequencing
technologies for resistance and virulence
profiling and phylogenetic typing*

Ana Carolina da Cruz Campos

This Ph.D. project was performed at the Department of Medical Microbiology and Infection Prevention Department of University Medical Center Groningen, University of Groningen, with the support of Hospital Universitário Pedro Ernesto, Universidade do Estado do Rio de Janeiro, in Rio de Janeiro, Brazil. The Abel Tasman Talent pro-gram supported this work. In addition, this work was also supported by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001, NTM and by a grant from the Ministry of Science, Research and the Arts of Baden-Württemberg (MWK) within the project "Surveillance von Mehrfach-Antibiotika-Resistenzen." Prof. Ana Claudia de Paula Ignácio and Dr. Paulo Vieira Damasco from the Universidade do Estado do Rio de Janeiro were mentors in this project.

The printing of this thesis was financially supported by:



ISBN: 978-94-034-2206-0 (printed version)

ISBN: 978-94-034-2205-3 (e-book)

Cover design: Andresso F. Agostine (Akili Design)

Printed by IPSKAMP printing

©Ana Carolina da Cruz Campos, 2020. No part of this publication may be reproduced or transmitted in any form or by any means without permission in writing from the author. The copyrights of previously published chapters of this thesis remains with the publisher or the journal.



university of
 groningen

Comprehensive characterization of *Escherichia coli* isolated from urine samples of hospitalized patients in Rio de Janeiro, Brazil

The use of next generation sequencing technologies for resistance and
virulence profiling and phylogenetic typing

PhD thesis

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

This thesis will be defended in public on

Monday 20 January 2020 at 9.00 hours

by

Ana Carolina da Cruz Campos

born on 15 July 1986
in Duque de Caxias, Brazil

Supervisor

Prof. J. W. A. Rossen

Co-supervisor

Dr. M. A. Chlebowicz-Flissikowska

Assessment committee

Prof. B. Sinha

Prof. J. Falcão Salles

Prof. P. Savelkoul

Paranimfen

Susie Pinhal

Maria Fernanda Vincenti Gonzalez

Contents

Chapter 1. General Introduction and Research questions and scope of the thesis	3
Chapter 2. Comprehensive Molecular Characterization of <i>Escherichia coli</i> Isolates from Urine Samples of Hospitalized Patients in Rio de Janeiro, Brazil	27
Chapter 3. Virulence and resistance properties of <i>E. coli</i> isolated from urine samples of hospitalized patients in Rio de Janeiro, Brazil – the role of mobile genetic elements	81
Chapter 4. Characterization of fosfomycin heteroresistance among MDR <i>Escherichia coli</i> isolates from hospitalized patients in Rio de Janeiro, Brazil	121
Chapter 5. Determining the virulence properties of <i>Escherichia coli</i> ST131 containing bacteriocin-encoding plasmids using short- and long-read sequencing and comparing them with those of other <i>E. coli</i> lineages	155
Chapter 6. Resistance and virulence properties of extraintestinal pathogenic <i>E. coli</i> causing nosocomial- and community-acquired urinary tract infections in hospitalized patients in Rio de Janeiro, Brazil	187
Chapter 7. Summarizing Discussion and Future perspectives	217
Appendices	
Apendix I English summary	233
Apendix II Nederlandse Samenvatting	239
Apendix III Resumo em Português	247
Apendix IV Bibliography	255
Apendix V Acknowledgements/Agradecimentos	275
Apendix VI About the author	281

