University of Groningen

Genomic heterogeneity of clear cell renal cell carcinoma

Ferronika, Paranita

DOI:
[10.33612/diss.101437783](https://doi.org/10.33612/diss.101437783)

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:
2019

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

Citation for published version (APA):
Ferronika, P. (2019). *Genomic heterogeneity of clear cell renal cell carcinoma*. [Thesis fully internal (DIV), University of Groningen]. Rijksuniversiteit Groningen. <https://doi.org/10.33612/diss.101437783>

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.

Genomic Heterogeneity of Clear Cell Renal Cell Carcinoma

Paranita Ferronika

The work presented on this thesis was mainly funded by Nuffic through Netherlands Fellowship Programmes (Grant NFP-PhD.13/119). Printing of this thesis was financially supported by Universitas Gadjah Mada, University of Groningen, and University Medical Center Groningen

Cover design & layout	Bianca Pijl, www.pijlldesign.nl Groningen, the Netherlands
Shibori pattern design	Beni Sulistiono and Neni Lastri
Printed by	Ipskamp Printing Enschede, the Netherlands
ISBN	978-94-034-2160-5 (<i>print</i>) 978-94-034-2159-9 (<i>digital</i>)

© Copyright: 2019 P. Ferronika, Groningen, the Netherlands

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

rijksuniversiteit
 groningen

Genomic Heterogeneity of Clear Cell Renal Cell Carcinoma

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

Tuesday 26 November 2019 at 11.00 hours

by

Paranita Ferronika

born on 7 November 1983
in Yogyakarta, Indonesia

Supervisor

Prof. R.H. Sijmons

Co-supervisors

Dr. K. Kok

Dr. H. Westers

Assessment Committee

Prof. H. Hollema

Prof. I.J. de Jong

Prof. R.M. Medeiros

Paranymphs

Joost Hof

Jiacong Wei

Table of contents

Chapter 1	Introduction	9
Chapter 2	Evaluation of the mutational profile as a prognostic factor in a population-based study of clear cell renal cell carcinoma	21
Chapter 3	Mutational heterogeneity between different regional tumour grades of clear cell renal cell carcinoma	51
Chapter 4	Comprehensive profiling of primary and metastatic ccRCC reveals a high homology of the metastases to a subregion of the primary tumour	79
Chapter 5	Copy number alterations assessed at the single-cell level revealed mono- and polyclonal seeding patterns of distant metastasis in a small-cell lung cancer patient	111
Chapter 6	Summary	127
Chapter 7	General discussion and future perspective	135
	Nederlandse samenvatting	151
	Acknowledgments	159
	Curriculum vitae	167