

Circadian timekeeping: from basic clock function to implications for health

Lucassen, Eliane Alinda

Citation

Lucassen, E. A. (2016, March 31). *Circadian timekeeping: from basic clock function to implications for health*. Retrieved from https://hdl.handle.net/1887/38651

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/1887/38651

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

Cover Page



Universiteit Leiden



The handle <u>http://hdl.handle.net/1887/38651</u> holds various files of this Leiden University dissertation

Author: Lucassen, Eliane Alinda

Title: Circadian timekeeping: from basic clock function to implications for health **Issue Date:** 2016-03-31

Circadian timekeeping: from basic clock function to implications for health

Eliane Alinda Lucassen Circadian timekeeping: from basic clock function to implications for health

ISBN: 978-94-6233-213-3

Cover photograph:handheld time machine, by Don UrbanCover & Lay-out:GildeprintPrinted by:Gildeprint

© Eliane A. Lucassen

All rights reserved. No part of this thesis may be reproduced or transmitted in any form or by any means, without written permission of the author.

Circadian timekeeping: from basic clock function to implications for health

Proefschrift

ter verkrijging van de graad van Doctor aan de Universiteit Leiden op gezag van de Rector Magnificus prof.mr. C.J.J.M. Stolker, volgens besluit van het College voor Promoties te verdedigen op 31 maart klokke 16:15

door

Eliane Alinda Lucassen

geboren te Leiden in 1986

Promotor

Prof. dr. J.H. Meijer

Copromotor

Prof. dr. A. Kalsbeek (Amsterdam Medical Center)

Promotiecommissie

dr. A.M. Aartsma-Rus Prof. dr. E. van Cauter (University of Chicago) Prof. dr. A.J.W. van der Does Prof. dr. G.T. van der Horst (Erasmus Medical Center)

The research presented in this thesis was performed at Leiden University Medical Center (LUMC) and at the National Institutes of Health (NIH). This work was supported by the Netherlands Organization for Scientific Research grant TOPGO.L.10.035 (to J.H. Meijer) and E.A. Lucassen received a MD PhD scholarschip from the LUMC, and Fulbright, Leiden University Fund (LUF) and VSBfonds scholarschips.



Printing of this thesis was kindly supported by Avantes, Alzheimer Nederland, Novo Nordisk and Kenniscentrum Koffie en Gezondheid. Financial support by the Dutch Heart Foundation for the publication of this thesis is gratefully acknowledged.

Table of contents

Chapter 1	General Introduction	7		
Chapter 2 Chapter 3	Interacting epidemics? Sleep curtailment, insulin resistance, and obesity. The hypothalamic-pituitary-adrenal axis, obesity, and chronic stress exposure: sleep and the HPA axis in obesity.	35 69		
PART I - The basic functioning of the circadian pacemaker				
Chapter 4	Role of vasoactive intestinal peptide in seasonal encoding by the suprachiasmatic nucleus clock.	87		
Chapter 5	Caffeine increases light responsiveness of the circadian pacemaker.	107		
Chapter 6	Amplitude of the SCN clock enhanced by the behavioral rhythm.	L23		
PART II - Health outcomes of altered circadian rhythms				

Chapter 7	The suprachiasmatic nucleus controls energy metabolism and insulin	145
	sensitivity.	
Chapter 8	Environmental 24-hour cycles are essential for health.	165

Chapter 9Evening chronotype is associated with changes in eating behavior,
more sleep apnea, and increased stress hormones in short sleeping
obese individuals.191

PART III – Health outcomes of insufficient sleep

Chapter 10	Sleep extension improves neurocognitive functions in chronically sleep- deprived obese individuals.	213
Chapter 11	The association between sleep parameters, osteopenia and sarcopenia in middle-aged men and women: the NEO study.	231
Chapter 12	General Discussion	257
Summary		289
Nederlandse samenvatting		293
Curriculum Vitae		297
Dankwoord	Dankwoord	
List of publica	tions	301