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Fetal and Neonatal Alloimmune Thrombocytopenia: evidence based screening

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List of abbreviations

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Dankwoord

List of abbreviations

AE	Adverse event
AUC	Area under the curve
CI	Confidence interval
CP	Cerebral palsy
CRF	Case report form
CS	Cesarean section
CV	Coefficient of variation
ECIS	Electric cell-substrate impedance sensing
EDTA	Ethylenediamine tetra-acetic acid
ELISA	Enzyme-linked immunosorbent assay
FBS	Fetal blood sampling
FcRn	Neonatal Fc-receptor
FNAIT	Fetal and neonatal alloimmune thrombocytopenia
GA	Gestational age
GMFCS	Gross motor function classification system
GP	Glycoprotein
HDFN	Hemolytic disease of fetus and newborn
HIP	HPA-screening in pregnancy
HLA	Human leukocyte antigen
HPA	Human platelet antigen
HUVEC	Human umbilical vein endothelial cell
ICH	Intracranial hemorrhage
IgG	Immunoglobulin G
IQR	Interquartile range
ITP	Immune thrombocytopenic purpura
IUFD	Intrauterine fetal demise
IUGR	Intrauterine growth restriction
IUPT	Intrauterine platelet transfusion
IVH	Intraventricular hemorrhage
IVIg	Intravenous Immunoglobulins
LUMC	Leiden university medical center
MMIC	Multidimensional measurement of informed choice
NCTS	Near-term cesarean section
NDI	Neurodevelopmental impairment
NOS	Newcastle-Ottawa scale
OD	Optic density
PCR	Polymerase chain reaction

PLT	Platelet
PSIE	Prenatal screening for infectious diseases and erythrocyte immunization
PTx	Platelet transfusion
RBC	Red blood cell
RCT	Randomized controlled trial
SD	Standard deviation
SE	Side effect
SGA	Small for gestational age
SNP	Single nucleotide polymorphism
TOP	Termination of pregnancy
W&J	Wilson and Jungner
WHO	World health organization
WISC-III	Wechsler Intelligence Scale for Children third edition
WPPSI-III	Wechsler Preschool Primary Scale of Intelligence third edition

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List of publications

Winkelhorst D, de Vos TW, Kamphuis MM, Porcelijn P, Lopriore E, Oepkes D, van der Schoot CE, de Haas M. HIP-study (HPA-screening In Pregnancy): Protocol of a nationwide, prospective and observational study to assess incidence and natural history of fetal/neonatal alloimmune thrombocytopenia and identifying pregnancies at risk. *Submitted*

Winkelhorst D, Oepkes D. Fetal and neonatal alloimmune thrombocytopenia: a 2020 update. *Submitted*

Winkelhorst D, Porcelijn L, Muizelaar E, Oldert G, Huiskes E, van der Schoot CE. Fast and low-cost direct ELISA for high-throughput serological HPA-1a typing. *Transfusion* 2019;**59**(9):2989-96.

Winkelhorst D, Oepkes D. Foetal and neonatal alloimmune thrombocytopenia. *Best practice & research. Clinical obstetrics & Gynaecology* 2019;**58**:15-27.

Winkelhorst D, Kamphuis MM, Steggerda SJ, Rijken M, Oepkes D, Lopriore E, van Klink JMM. Perinatal outcome and long-term neurodevelopment after intracranial haemorrhage due to fetal/neonatal alloimmune thrombocytopenia. *Fetal diagnosis and therapy* 2018;**4**:1-8.

Winkelhorst D, Oostweegel M, Porcelijn L, Middelburg RA, Zwaginga JJ, Oepkes D, van der Bom JG, de Haas M, Lopriore E. Treatment and outcomes of fetal/neonatal alloimmune thrombocytopenia: a nationwide cohort study in newly detected cases. *British Journal of Haematology* 2018;**184**(6):1026-9.

Winkelhorst D, Oepkes D, Lopriore E. Fetal and neonatal alloimmune thrombocytopenia: evidence based antenatal and postnatal management strategies. *Expert Review Hematology* 2017;**10**(8):729-37.

Winkelhorst D, Loeff RM, van den Akker – van Marle ME, de Haas M, Oepkes D. Women's attitude towards routine human platelet antigen-screening in pregnancy. *Acta Obstetrica Gynecologica Scandinavica* 2017;**96**(8):991-7.

Winkelhorst D, Murphy MF, Greinacher A, Shehata N, Bakchoul T, Massey E, Baker J, Lieberman L, Tanael S, Hume H, Arnold DM, Baidya S, Bertrand G, Bussel J, Kjaer M, Kaplan C, Kjeldsen-Kragh J, Oepkes D, Ryan G. Antenatal management in fetal and neonatal alloimmune thrombocytopenia: a systematic review. *Blood* 2017;**129**(11):1538-47.

Stegmann TC, Veldhuisen B, Nagelkerke SQ, Winkelhorst D, Schonewille H, Verduin EP, Kuijpers TW, de Haas M, Vidarsson G, van der Schoot CE. Rhlg-prophylaxis is not influenced by FCGR2/3 polymorphisms involved in red blood cell clearance. *Blood* 2017;**129**(8):1045-8.

Kamphuis M, Paridaans N, Winkelhorst D, Wikman A, Tiblad E, Lopriore E, Westgren M, Oepkes D. Lower-dose intravenous immunoglobulins for the treatment of fetal and neonatal alloimmune thrombocytopenia: a cohort study. *Transfusion* 2016;**56**(9):2308-13.

Winkelhorst D, Kamphuis MM, de Kloet LC, Zwaginga JJ, Oepkes D, Lopriore E. Severe bleeding complications other than intracranial hemorrhage in neonatal alloimmune thrombocytopenia: a case series and review of the literature. *Transfusion* 2016;**56**(5):1230-5.

Chapter in edited book

Winkelhorst D, Oepkes D. Fetal platelet disorders. In: Pandya PP, Wapner RJ, Oepkes D & Sebire N, eds. *Fetal Medicine: Basic Science and Clinical Practice*. 3rd ed. London. Elsevier; 2018.

Winkelhorst D, Oepkes D. Fetal and neonatal alloimmune thrombocytopenia Clinical disease and management. In: Kilby MD, Johnsen A, Oepkes D, eds. *Fetal Therapy*. 2nd ed. Cambridge. Cambridge University Press; 2019.

Van der Schoot CE, Winkelhorst D, Banch Claussen F. Non-Invasive Fetal Blood Group Typing. In: Klein & Christiaens. *Non-Invasive Prenatal Testing (NIPT): Applied Genomics in Prenatal Screening and Prenatal Diagnosis*. 1st ed. Elsevier; 2018.

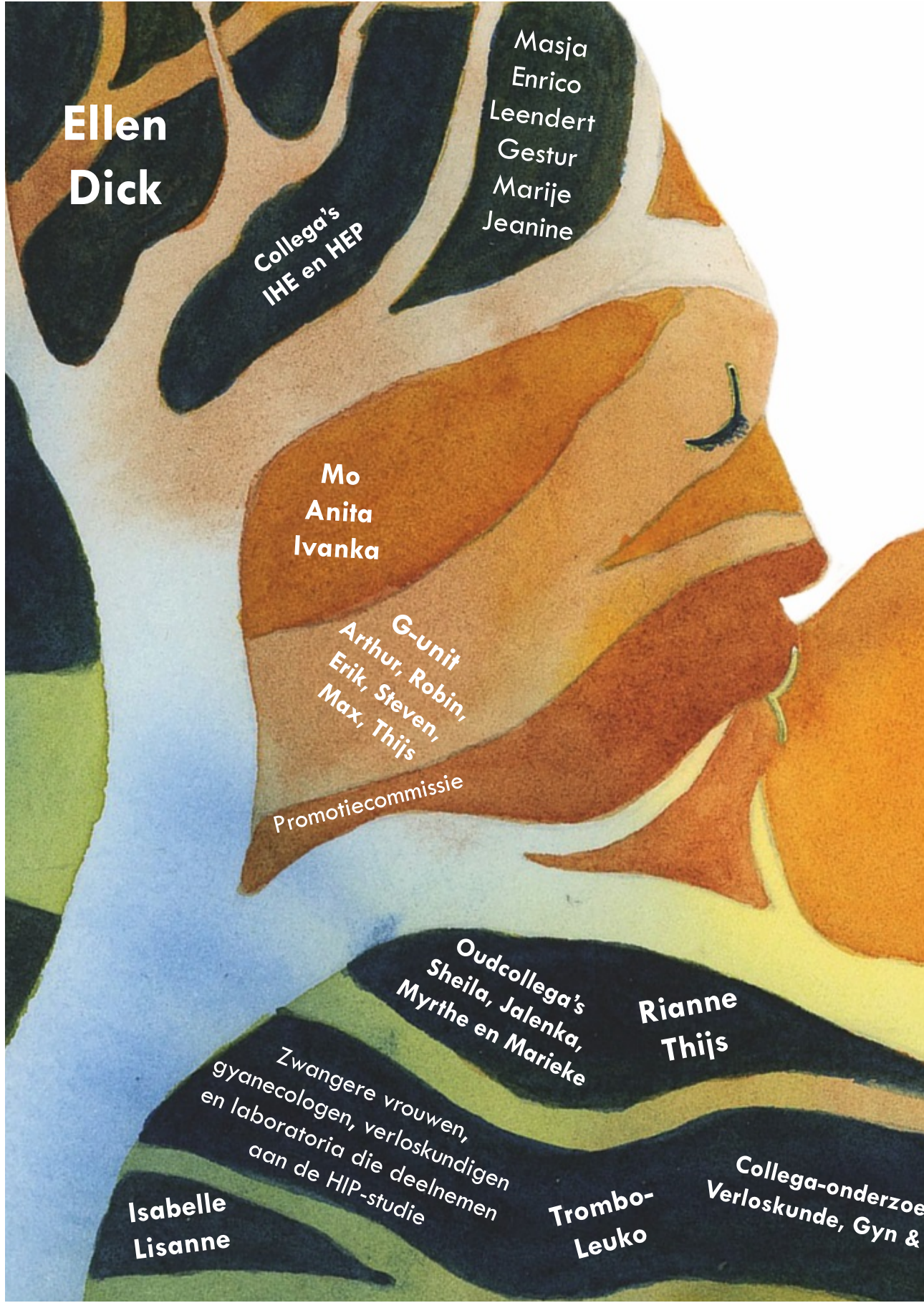
Curriculum Vitae

Dian Winkelhorst, author of this thesis was born at home in Rekken on the 3rd of July 1989. She grew up in the Achterhoek, in the east of the Netherlands together with her two sisters Minoë and Tess. In 2006, she obtained her gymnasium diploma at R.K.S.G. Marianum in Groenlo.

After her graduation, she moved to Utrecht and started medical school at Utrecht University. After her Obstetrics and Gynecology internship at St. Antonius Hospital in Nieuwegein she developed special interest towards this specialty. During her scientific internship in 2013, she studied reasons for RhD alloimmunization despite adequate prophylaxis with the guidance of Dr Lieve Page-Christaens and Prof. C. Ellen van der Schoot. After she attained her medical degree in March 2014, she started working as a physician (ANIOS) at the department of Obstetrics and Gynecology at St. Antonius Hospital in Nieuwegein.

In 2015, she was offered a PhD position by Prof. C. Ellen van der Schoot to study Fetal and Neonatal Alloimmune Thrombocytopenia. This project was a collaboration between the division of Fetal Therapy (Prof. D. Oepkes), department of Obstetrics at Leiden University Medical Center (LUMC) and department of Experimental Immunohematology at Sanquin (Prof. C. Ellen van der Schoot). As part of her PhD, Dian set up the HIP-study, a nationwide prospective observational study. In 2017, Dian received the 'De Snoo van 't Hoogerhuijs Stichting - Junior Research Award' for her research proposal "Can we identify HPA-1a alloimmunized pregnancies at high risk for developing fetal or neonatal bleeding complications?". In October 2019, she started her residency at St. Antonius Hospital under the supervision of Dr G.C.M. Graziosi.

Dian lives in Utrecht together with Wouter and their son Rein (2018).



**Ellen
Dick**

Collega's
IHE en HEP

Masja
Enrico
Leendert
Gestur
Marije
Jeanine

Mo
Anita
Ivanka

G-unit
Arthur, Robin,
Erik, Steven,
Max, Thijs

Promotiecommissie

Oudcollega's
Sheila, Jalenka,
Myrthe en Marieke

Rianne
Thijs

Zwangere vrouwen,
gyanecologen, verloskundigen
en laboratoria die deelnemen
aan de HIP-studie

Isabelle
Lisanne

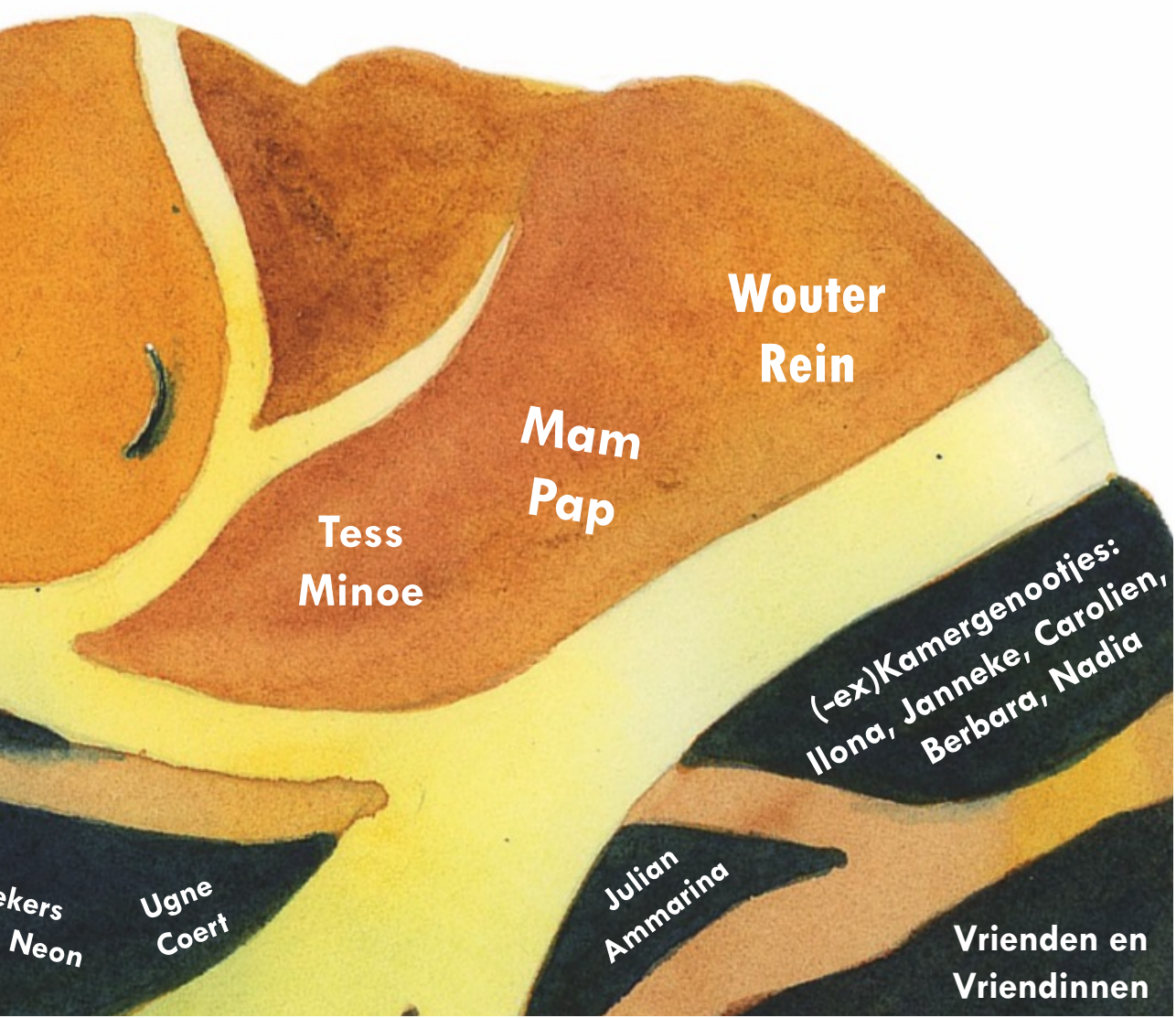
Trombo-
Leuko

Collega-onderzoek
Verloskunde, Gyn &

It always seems impossible until it's done

- Nelson Mandela -

Thank you!



Wouter
Rein

Mam
Pap

Tess
Minoe

(-ex)Kamergenootjes:
Ilona, Janneke, Carolien,
Barbara, Nadia

Julian
Ammarina

Vrienden en
Vriendinnen

Ugne
Coert

ekers
Neon