

CHDR
Centre for Human Drug Research

Highlights

2025





This report offers a preview of our upcoming annual report, celebrating a year of strategic focus, innovation and collaboration, building the foundation for CHDR's next phase of growth.



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2025 in Numbers



60

studies conducted

32 healthy volunteer, 19 patient and 9 combined studies



15,000

volunteer applications

3,505 patients
11,441 healthy volunteers



46

days CTA
approval under CTR



31

clinical trial applications

23 approved in 2025, 8 pending



1

clinical pharmacology
graduate



6

new flexible research
rooms

Our newly opened CHDR Twente
added 6 flexible research rooms with
up to 12 beds



7

PhDs graduated



91.8%

studies executed as planned



74

articles published in
peer-reviewed journals



24

contracts signed



8.9/10

overall study participant
satisfaction

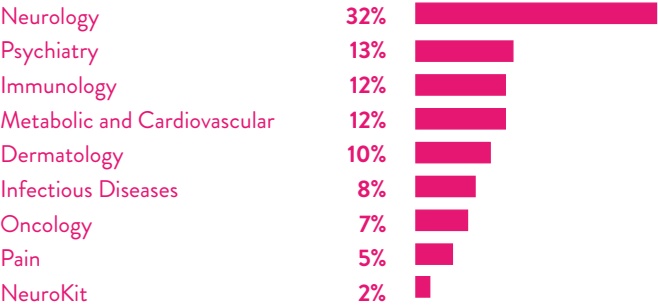


9.3/10

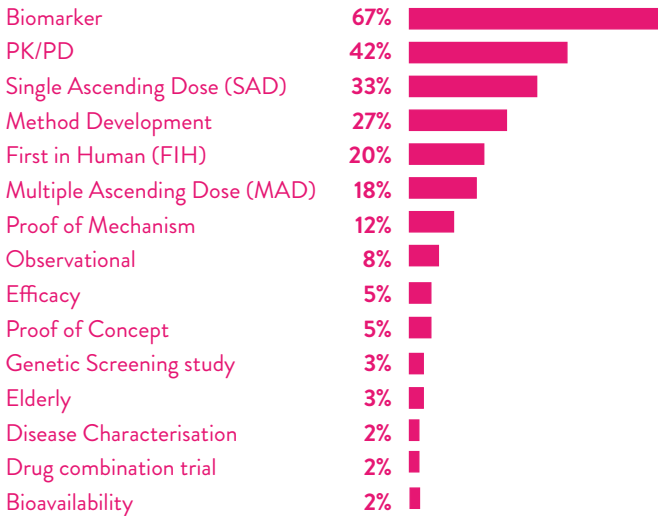
overall sponsor
satisfaction



RESEARCH AREAS



TYPES OF STUDIES



CHDR NEWS

This year we launched the NeuroKit and opened a new unit in Twente.



July

CHDR officially launched the NeuroKit; our innovative, portable CNS testing platform. Building on decades of experience with the validated NeuroCart, NeuroKit brings the same high-quality, data-driven CNS pharmacodynamic testing to external research sites worldwide, a milestone in expanding access to early-phase CNS insights.



October

Celebrated the official opening of CHDR Twente, our new clinical research unit located at Medisch Spectrum Twente (MST) in Enschede. In July we already screened the first volunteer for our investigator-initiated study. We are excited to contribute to the strong research and MedTech cluster in Twente.



CHDR Twente

Our new research unit in Twente located at MST hospital, expands our expertise, collaboration and bed capacity. The unit contains **6** flexible research rooms with up to **12** clinical beds, **2** CNS-dedicated rooms with EEG and TMS capabilities, a screening room, a living room, and a bedside lab. [Take a tour here](#)

Dermatology



Highlights

- Recruited **45 participants** with Hidradenitis Suppurativa, Psoriasis, and Atopic Dermatitis for our observational cross-sectional study in **6 months**.
- Completed the enrollment of the **500th Psoriasis patient** at CHDR.
- Initiated **8 centers** for our nationwide Skinergy study, completing the recruitment of the first **25 patients**.
- Developed **multi-omics** workflow of **skin punch biopsies**.



Celebrated the 500th psoriasis patient.



Collaborations & conferences

- Presented **30+ oral and poster** abstracts at ESDR, EADV, ISDS, Dermatology Drug Summit Europe & US, DMD and NVED.
- Delivered **1 collaborative presentation** with patient advocacy group **Psoriasispatienten Nederland** at EADV.
- Presented **7 expert lectures** on Innovation in Dermatology in Boston, Berlin, Paris, Enschede, Antwerp, Utrecht and New York City.
- Conducted **monthly meetings** with **7 patient advocacy groups**:
 - Hidradenitis suppurativa
 - Atopic dermatitis
 - Cutaneous lupus erythematosus
 - Chronic spontaneous urticaria
 - Cutaneous T-cell lymphoma
 - Psoriasis
 - General skin conditions



Key publications

Inflammatory Skin Diseases Multi-omics Profiling of Chronic, Immune-mediated Inflammatory Skin Diseases: Study Protocol for the SKINERGY Prospective Biomarker Study in the Netherlands. Koster, N., van Ee, I., van den Broek, P., *et al.*, 2025. *Journal of Investigative Dermatology*. DOI: [S0022202X25029835](https://doi.org/10.1016/j.jid.2025.02.001)

Extending the IMQ Model: Deep Characterization of the Human TLR7 Response for Early Drug Development. Van den Noort JA, Assil S, Ronner MN, *et al.*, 2025. *Inflammation*. DOI: [10.1007/s10753-024-02127-x](https://doi.org/10.1007/s10753-024-02127-x)

Evaluation of Machine Learning Model Performance in Diabetic Foot Ulcer: Retrospective Cohort Study. Van Velze, V.Y., Burger, H.L., van der Steenhoven *et al.*, 2025. *JMIR Medical Informatics*. DOI: [10.2196/71994](https://doi.org/10.2196/71994)

A suction blister model to characterize epidermal wound healing and evaluate the efficacy of the topical wound healing agent INM-755 in healthy volunteers. Ten Voorde, W., Wind, S., Abdisolaam, *et al.*, 2025. *European Journal of Pharmaceutical Sciences*. DOI: [10.1016/j.ejps.2024.106867](https://doi.org/10.1016/j.ejps.2024.106867)

Mild psoriasis as a suitable model for proof-of-mechanism in a phase 1B setting: Results from a double-blind placebo-controlled trial with guselkumab. Rousel, J., Bergmans, M.E., Bruijninx, L.J., *et al.*, 2025. *British Journal of Clinical Pharmacology*. DOI: [10.1002/bcp.70179](https://doi.org/10.1002/bcp.70179)



Highlights

- Continued growth in **Proof of Mechanism** studies in healthy volunteers using CHDR's **LPS** and **KLH** models.
- Advanced biometric analysis of **large omics-based datasets** for CHDR's key inflammation models resulting in:
 - Detailed **physiological characterization** of inflammatory models
 - Insights into the **mechanistic overlap** between models and **pathophysiological pathways**
- Successful **development** of a unique **human *in vivo* vascular leak model** for the characterization of **Sepsis**, and presented a **new human oral cholera toxin challenge** model to drive mucosal immune responses.
- Achieved significant development progress in functional cell assays: **inflammation**, **lysosomal function**, **mitochondrial function**, **immunometabolism** and **platelet function**.
- Initiation of new methodology development: **low-dose IL-2 challenge** for controlled induction of T cell responses, and ***in vivo* UVB skin challenge** to **drive cGAS-STING** signaling.



Collaborations & conferences

- Presented **5 posters** at BeNeLux Metabolomics Days, EULAR, EADV, Figon Dutch Medicines Days and BPS.
- Presented **4 expert lectures** at Rheumatic and Autoimmune Disorders, Sanofi Bridging Summit for Immunoscience, European Academy of Dermatology and Venereology and Dutch Complement Network Symposium.
- Strategic **collaborations**:
 - Longstanding collaborations with **University College London** on **peripheral tissue inflammation** and with **Leiden University** on **complement activity**.
 - Partner in **Marie Curie Actions** project on **immunometabolism**, PPP project on the evaluation of **preclinical data** for **cell-based therapies**, and in a **European Food Safety Agency** project on **leukocyte toxicodynamics**.
 - Initiation of **functional immunomonitoring** of **rheumatoid arthritis patients**, in collaboration with Haga Hospital.



Key publications

Breaking Barriers: Characterization of the Intradermal Lipopolysaccharide Challenge as an In Vivo Model for Controlled Induction of Vascular Leakage in Healthy Volunteers. Van Ruissen M., van Diemen M., Botros L., *et al.*, 2025. Clinical Pharmacology & Therapeutics. DOI: [10.1002/cpt.70126](https://doi.org/10.1002/cpt.70126).

Adverse immunostimulation in early phase clinical trials: Key findings and recommendations based on the investigator's clinical experience. Van den Noort J., van Ruissen M., Smidt L., *et al.*, 2025. British Journal of Clinical Pharmacology. DOI: [10.1002/bcp.70276](https://doi.org/10.1002/bcp.70276).

Profiling a Neo-Antigen-Driven Immune Response in Healthy Volunteers: A Randomized, Double-Blind, Placebo-Controlled Study of the KLH Challenge Model. Ronner M., Grievink H., Saghari M., *et al.*, 2025. Clinical Pharmacology & Therapeutics. DOI: [10.1002/cpt.70007](https://doi.org/10.1002/cpt.70007).

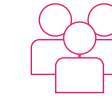
Infectious Diseases

INFECTIOUS DISEASES



Highlights

- In 2025 we developed 3 Controlled Human Infection Models (CHIMs):
 - Chikungunya CHIM
 - RSV CHIM
 - Influenza CHIMThese models are ready to be implemented in the early clinical development of vaccines and treatments against infectious diseases
- In 6 weeks, we screened 50 participants and found 10 participants with the right background immunity for an influenza CHIM study.
- For an RSV-B study, we performed 800 nasal swaps in 45 participants who also completed >1700 questionnaires via ePRO.



Collaborations & conferences

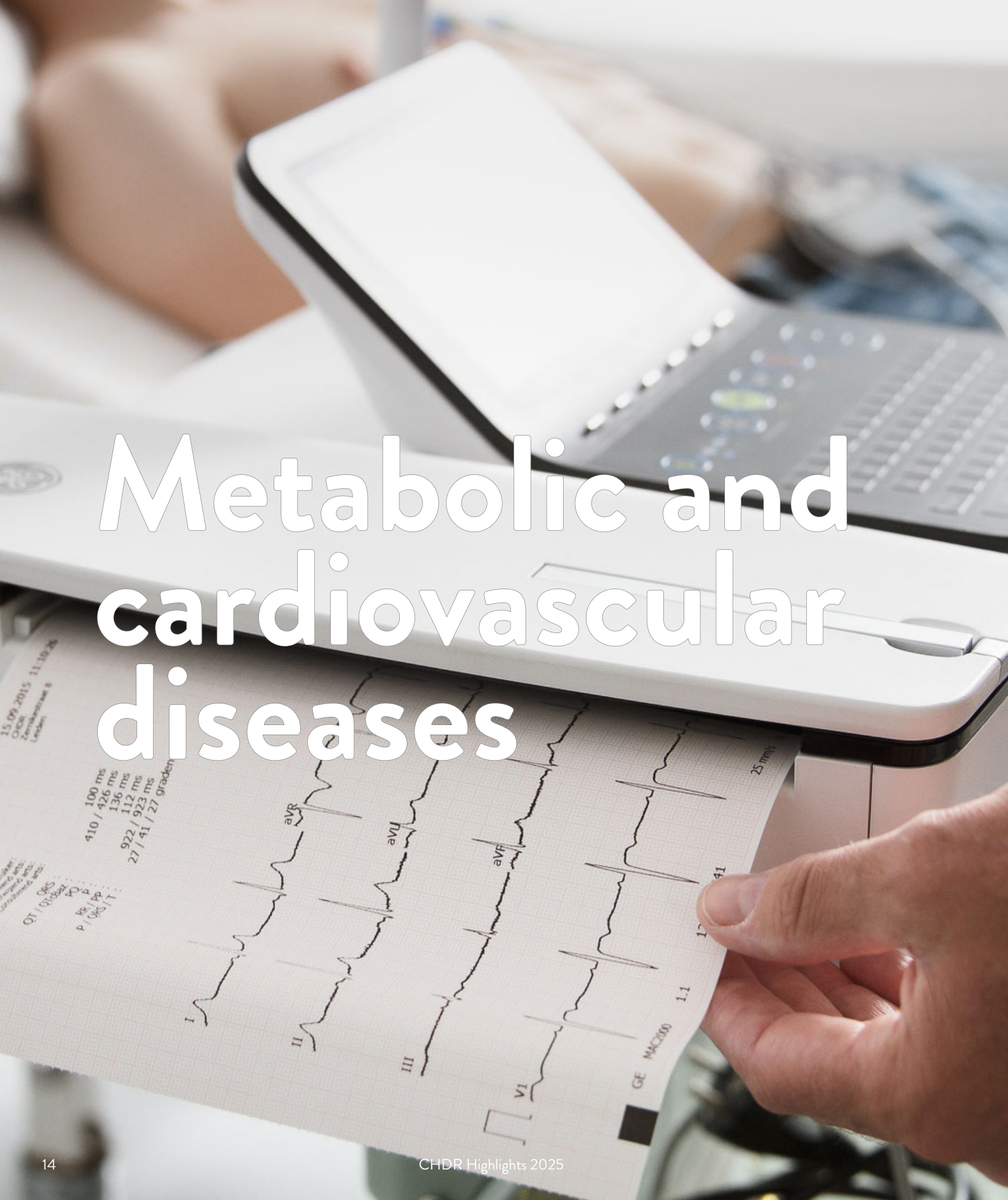
- Started a collaboration with INFECTA by signing an MSA. INFECTA is a spinout from CHDR together with university hospitals (LUMC, AUMC, Radboud MC and UMCU) focused on early clinical research of vaccines and therapeutics against infectious diseases. INFECTA will build a unit at the Leiden bioscience park with BSL-3 capabilities and work with CHDR's procedures.
- Together with CHDR, INFECTA positioned Leiden as a global leader in CHIMs by presenting at 3 conferences (ESCMID, ESWI and WVC).
- Presented the RSV CHIM results at ESWI in Valencia.



Key publications

Development of an intranasal, universal influenza vaccine in an EU-funded public-private partnership: the FLUniversal consortium. Cnossen V., Moreira P., Engelhardt O., et al., 2025. *Frontiers in Immunology*. DOI: [10.3389/fimmu.2025.1568778](https://doi.org/10.3389/fimmu.2025.1568778)

Regulatory workshop on standardisation of clinical procedures, endpoints and data robustness of human challenge studies - A stakeholder meeting report. Meln I., Cnossen V., Corti N., et al., 2025. *Biologicals*. DOI: [10.1016/j.biologicals.2025.101818](https://doi.org/10.1016/j.biologicals.2025.101818)



Metabolic and cardiovascular diseases



Highlights

- Appointed [Liza Botros](#), an experienced clinical scientist, to shape and advance the cardiovascular and metabolic therapeutic area together with [Naomi Klarenbeek](#).
- Developed and validated **3 methodologies**:
 - non-invasive [hemodynamic monitoring](#) of vitals and [cardiac contractility](#)
 - [iontophoresis](#) to quantify vascular drug effects
 - [in vivo LPS](#) challenge as a model for [vascular leakage](#)
- Planned **2 CHDR initiated studies** to develop novel metabolic methods:
 - Profiling multi-omics and intracellular responses to [48-hour fasting](#) and [mixed-meal challenges](#) in [obese](#) versus [healthy participants](#).
 - Quantifying [satiety](#), [satiation](#), and [food hedonics](#)



Collaborations & conferences

- Collaborated with [cardiologists at Medisch Spectrum Twente](#) on therapeutic strategies for [Heart Failure](#) with reduced Ejection Fraction (HFrEF) and Preserved Ejection Fraction (HFpEF).
- Collaboration with Prof. Christa Cobbaert, KCL LUMC, on a [apolipoprotein and acute kidney injury panel](#).
- Collaboration with Dr. Liesbeth Winter, Endocrinology, LUMC, on [glucocorticoid receptor sensitivity](#).
- Collaboration with Prof. Daniel van Raalte, AUMC on [diabetic vascular diseases](#).



Key publications

Proof of Pharmacology, Safety, and Pharmacokinetics of the Novel TRPA1 Antagonist BI 1839100: A Randomized, Placebo-Controlled, Parallel Group, First-In-Human Study in Healthy Male Participants. Van Ruissen, M.C., van Kraaij, S.J., Wolfova, J. *et al.*, 2025. *Clinical and Translational Science*. DOI: [10.1111/cts.70290](https://doi.org/10.1111/cts.70290)

Breaking Barriers: Characterization of the Intradermal Lipopolysaccharide Challenge as an In Vivo Model for Controlled Induction of Vascular Leakage in Healthy Volunteers. Van Ruissen, M.C.E., van Diemen, M., Botros, I., *et al.*, 2025. *Clinical Pharmacology & Therapeutics*. DOI: [10.1002/cpt.70126](https://doi.org/10.1002/cpt.70126)



NeuroKit[®]

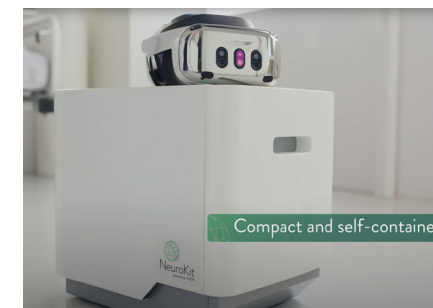


NEUROKIT



Highlights

- Completed the [1st interventional validation trial](#) where the NeuroKit was compared to the NeuroCart. We confirmed that the NeuroKit can quantify drug effects as tested with a sedative, a stimulant, and a dissociative drug.
- The [1st version](#) of the [NeuroKit](#) is available and ready to be tested in the [first off-site clinical trial](#) to begin enrollment in 2026.
- The [Side Tapping test](#) is successfully being used in [2 off-site clinical trials](#) not conducted by CHDR.
- Launched our [NeuroKit video](#):



Interested? Find more information on the NeuroKit on our [website](#).



Collaborations & conferences

- We set-up a [strategic partnership](#) with [ERG](#) and [Lotus](#) in the U.S. to join forces in commercialising the NeuroKit in the U.S.
- Presented the NeuroKit at [2 conferences](#), [ASCP](#) and [NPDD](#) and received an enthusiastic response.



We installed the NeuroKit at the Clinical Pharmacology unit of Miami in our partnership with Lotus ERG. Here, the NeuroKit will be used for the first off site study in 2026.



Key publications

Currently preparing a publication based on the results of the interventional trial, stay tuned for the publication in 2026.



Neurology

NEUROLOGY



Highlights

- Successfully recruited **181 Parkinson's patients** for studies in 2025, which is a **600% growth** in recruitment compared to 2024.
- Developed **3 new methods**:
 - Investigated proteins present in **cerebrospinal fluid** during an **inflammatory response** to gain insights on **neuroinflammation**.
 - Validated the **IO curve for TMS**, which can reliably show the relationship between **stimulation intensity** and **corresponding muscle response amplitude** to assess corticospinal excitability and motor recruitment.
 - **Optimized the biperiden challenge** model by replacing the oral dose with an IV administration, reducing PK variability and resulting in a **reliable model for studying acetylcholine signaling**.
- Completed **462 lumbar punctions** for PK and PD bioanalysis in 2025.



Collaborations & conferences

- Completed a large genetic screening study where we identified **161 GBA-PD Parkinson's patients** in **20 months**. To achieve this, we collaborated with **16 hospitals**, **3 Parkinson cafés**, organized **4 symposia**, attended 1 symposium and initiated a large **social media** campaign.
 - This was an at-home study where identified **161 GBA-PD Patients** by:

1300	Applications
1700	Saliva collection kits sent
1251	Saliva kits returned
1197	QC'd kits sent to analysis lab
161	GBA-PD patients found
 - During this study we donated €21,400 to stichting parkinsonNL and €21,400 to Stichting Parki to improve lives of Parkinson's patients and invest in future research.
- Presented **1 poster** at ECCN in collaboration with Pain department.
- Delivered **2 keynote presentations** at AD/PD.



Key publications

Cannabidiol Lacks Direct Effect on Cortical Excitability: A Randomized, Double Blind, Placebo Controlled, 3-Way Crossover Trial. Gorbenko, A.A., de Cuba, C.M., de Goede, A.A., *et al.*, 2025. *Clinical Pharmacology & Therapeutics*. DOI: [10.1002/cpt.70038](https://doi.org/10.1002/cpt.70038)

TMS and EEG Pharmacodynamic Effects of a Selective Sphingosine-1-Phosphate Subtype 1 Receptor Agonist on Cortical Excitability in Healthy Subjects. De Cuba, C.M., de Goede, A.A., Klaassen, *et al.*, 2025. *Clinical Pharmacology & Therapeutics*. DOI: [10.1002/cpt.3521](https://doi.org/10.1002/cpt.3521)

Safety, Pharmacokinetics, and Pharmacodynamics of a First-in-Class CIC-1 Inhibitor to Enhance Muscle Excitability: Phase I Randomized Controlled Trial. Ruijs T, de Cuba C., Heuberger J.A., *et al.*, 2025. *Clinical Pharmacology & Therapeutics*. DOI: [10.1002/cpt.3516](https://doi.org/10.1002/cpt.3516)

CB1 Receptor Antagonist Selonabant (ANEB-001) Blocks Acute THC Effects in Healthy Volunteers: A Phase II Randomized Controlled Trial. Gorbenko A.A., Heuberger J. Juachon M., *et al.*, *Clinical Pharmacology & Therapeutics*. DOI: [10.1002/cpt.3581](https://doi.org/10.1002/cpt.3581)



Oncology

ONCOLOGY



Highlights

- Appointed **Igor Radanović** as Experienced Clinical Scientist Oncology to shape and advance CHDR's Immuno-oncology services.
- Explored CHDR's **in vivo immune challenge methods** for oncological **pathway** induction: characterization of **intravenous LPS challenge** model for druggable oncological targets.
- Initiated a novel methodology: **in vivo UVB challenge study** in healthy volunteers to characterize DNA damage and senescence responses.
- Developed and applied human blood-based cell stress assays: **stem cell factor-induced activation of c-KIT** in primary human leukocytes, for evaluation of pharmacological activity of imatinib in healthy volunteers.



Collaborations & conferences

- Presented **1 lecture** at LorentZ Center Cancer Workshop, and presented **1 poster** at ESMO Targeted Anticancer Therapies Congress.
- Collaborated with the **Dutch Cancer Institute (NKI)** on **hypersensitivity responses** in oncology patients following paclitaxel or liposomal doxorubicin treatment.
- Conducted a project with Leiden Institute of Chemistry on **cellular endogenous kinase targeting (CelleKT)** in primary human leukocytes to evaluate the relevance of human kinome for future oncology studies.



Key publications

85P Challenges turned into opportunities: human immune challenge models to guide dose-finding in early-phase oncology drug development in healthy subjects. Radanović I., van den Noort J., Jansen M., *et al.*, 2025. *ESMO Open*, 10. DOI: [S2059-7029\(25\)](https://doi.org/10.1111/bcp.16336)

Intravenous lipopolysaccharide challenge induced expression of potentially druggable oncological targets in peripheral blood and bone marrow of healthy volunteers: an innovative approach for early pharmacology trials. Radanović I., Tomljanovic I., Jansen M., *et al.*, 2025. *BPS Pharmacology* 2025, 247. DOI: [10.1111/bcp.16336](https://doi.org/10.1111/bcp.16336)



PAIN



Highlights

- Validated a [high frequency stimulation method](#) as a biomarker of central sensitization.
- Intensified the collaboration with the LUMC [respiratory facility](#) to investigate drug effects on respiratory depression.
- Included almost [100 neuropathic pain patients](#) in our patient study investigating the effects of cannabis on neuropathic pain.
- The refocus of CHDR on Pain research has led to a [150% increase in number of clinical trials](#) in this area.
- Successfully completed a complex PD study including [216 CNS measurements](#) and [180 blood samples](#) in [3 Months](#) with:
 - [72 PainCart measurements](#)
 - [72 Intraepidermal electric stimulation \(IES\) measurements](#)
 - [72 Threshold tracking measurements](#)



Collaborations & conferences

- [Received a grant](#) to develop [PainCart 2.0](#) together with the University of Twente. The PainCart 2.0 will receive a software update, additional evoked potential tests and ergonomic improvements.
- [Presented 1 expert lecture](#) at the Pain Therapeutic Summit in San Diego among key opinion leaders in the field of early drug development of analgesics.
- [Presented 1 poster](#) at ECCN and DMD (FIGON) on our [excitability methods](#).



Key publications

A comparison of intramuscular (Zimhi) and intranasal naloxone (Narcan) in reversal of fentanyl-induced apnea: a randomized, crossover, open-label trial. Van Lemmen, M.A., van Velzen, M., Sarton, E.Y., Dahan, A., Niesters, M *et al.*, 2025. *Nature Communications*, p16. DOI: [10.1038/s41467-025-59932-](https://doi.org/10.1038/s41467-025-59932-)

CB1 Receptor Antagonist Selonabant (ANEB-001) Blocks Acute THC Effects in Healthy Volunteers: A Phase II Randomized Controlled Trial. Gorbenko, A.A., Heuberger, J.A., Juachon, *et al.*, 2025. *Clinical Pharmacology & Therapeutics*. DOI: [10.1002/cpt.3581](https://doi.org/10.1002/cpt.3581)

Application of a Nociceptive Test Battery to Assess Potential Synergy between Two Analgesics in Healthy Subjects. Bakker, W.A., Bertayli, M., Dumas *et al.*, 2025. *ACS Pharmacology & Translational Science*. DOI: [10.1021/acspsci.4c00696](https://doi.org/10.1021/acspsci.4c00696)

The impact of a virtual wound on pain sensitivity: insights into the affective dimension of pain. Koopmans I., Doll R.J., Hagemeyer M., *et al.*, 2025. *Frontiers in Pain Research*. DOI: [10.3389/fpain.2025.1502616](https://doi.org/10.3389/fpain.2025.1502616)

Psychiatry



Highlights

- Received approval for a study combining functional Near-Infrared Spectroscopy (fNIRS) and a portable Electroencephalogram (EEG) to study a 5-HT2A agonist.
- Started CHDR's largest proof-of-mechanism study to date using the CO₂ inhalation challenge to investigate the potential anxiolytic effect of a novel, subtype selective PAM.
- Completed a FIH study with the psychedelic MSD-001 (5-MeO-MiPT), that included subjective drug effects, qEEG, NeuroCart and fMRI as pharmacodynamic measures.
- Explored roving mismatch negativity (rMMN), Visual Evoked Potential Long Term Potentiation (VEP-LTP), resting state fMRI and ex-vivo LPS stimulated PBMCs as potential biomarkers for the sustained pharmacodynamic effects of 5-HT2A agonists.



Collaborations & conferences

- Started a collaboration with Leiden University FSW on a psilocybin study. FSW received a grant from Norrskén Mind Psychedelic Science Initiative foundation. Together, we will investigate the neurocognitive and psychological mechanisms underlying the therapeutic potential of psilocybin.
- Presented 2 posters at the 38th European College of Neuropsychopharmacology (ECNP) on neuroplastogens as treatment for Major Depressive Disorder and the characterization of a novel NMDA receptor agonist.



Key publications

Biomarker-Based Pharmacological Characterization of ENX-102, a Novel alpha 2/3/5 Subtype-Selective GABAA Receptor Positive Allo-Steric Modulator: Translational Insights from Rodent and Human Studies. Nettesheim, P., Vadodaria, K.C., Vanover, K.E., *et al.*, 2025. *Cells*. DOI: [10.3390/cells14201575](https://doi.org/10.3390/cells14201575)

Safety, Pharmacokinetics, and Pharmacodynamics of a 6-h N, N-Dimethyltryptamine (DMT) Infusion in Healthy Volunteers: A Randomized, Double-Blind, Placebo-Controlled Trial. Van Der Heijden, K.V., Zuiker, R.G., Otto, M.E., *et al.*, 2025. *Clinical and Translational Science*. DOI: [10.1111/cts.70234](https://doi.org/10.1111/cts.70234)

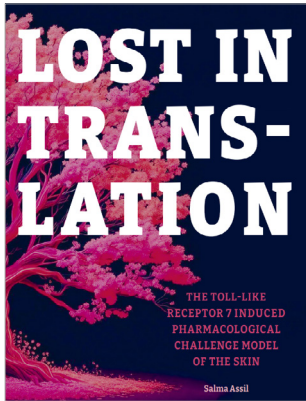
A novel psychedelic 5-HT2A receptor agonist GM-2505: The pharmacokinetic, safety, and pharmacodynamic profile from a randomized trial healthy volunteer. Marek, G.J., Makai-Bölöni, S., Umbricht, D., *et al.*, 2025. *Journal of Psychopharmacology*. DOI: [10.1177/02698811251378512](https://doi.org/10.1177/02698811251378512)

Clinical Pharmacokinetics of N, N-Dimethyltryptamine (DMT): A Systematic Review and Post-hoc Analysis. Van der Heijden, K.V., Otto, M.E., Schoones, J.W., *et al.*, 2025. *Clinical Pharmacokinetics*. DOI: [10.1007/s40262-024-01450-8](https://doi.org/10.1007/s40262-024-01450-8)

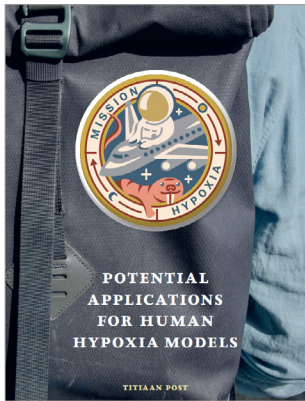
Clinical Pharmacokinetics of Psilocin After Psilocybin Administration: A Systematic Review and Post-Hoc Analysis. Otto, M.E., van der Heijden, K.V., Schoones *et al.*, 2025. *Clinical pharmacokinetics*. DOI: [10.1007/s40262-024-01454-4](https://doi.org/10.1007/s40262-024-01454-4)

PhD theses

Seven PhD candidates successfully defended their thesis in 2025: Salma Assil, Titiaan Post, Ruben Meijer, Francis Dijkstra, Ruben Houvast, Laurence Moss and Ingrid Koopmans.



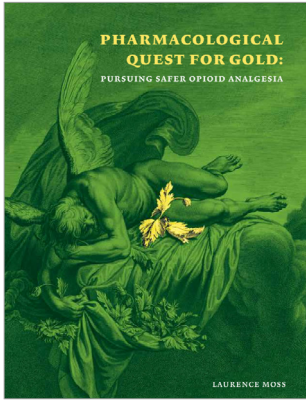
Salma Assil
Lost in translation: The Toll-like receptor 7 induced pharmacological challenge model of the skin



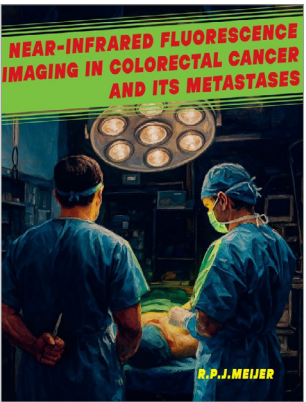
Titiaan Post
Potential Applications for Human Hypoxia Models



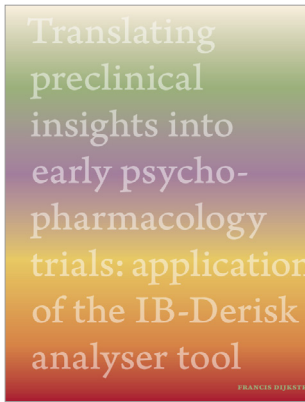
Ruben Houvast
Enhancing visualization of gastrointestinal tumors



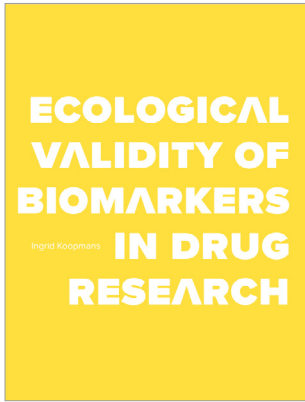
Laurence Moss
Pharmacological quest for gold: pursuing safer opioid analgesia



Ruben Meijer
Near-Infrared fluorescence imaging in colorectal cancer and its metastases



Francis Dijkstra
Translating preclinical insights into early psychopharmacology trials: application of the IB-Derisk analyser tool



Ingrid Koopmans
Ecological validity of biomarkers in drug research

Find their PhD thesis here:
[Library- CHDR](#)

