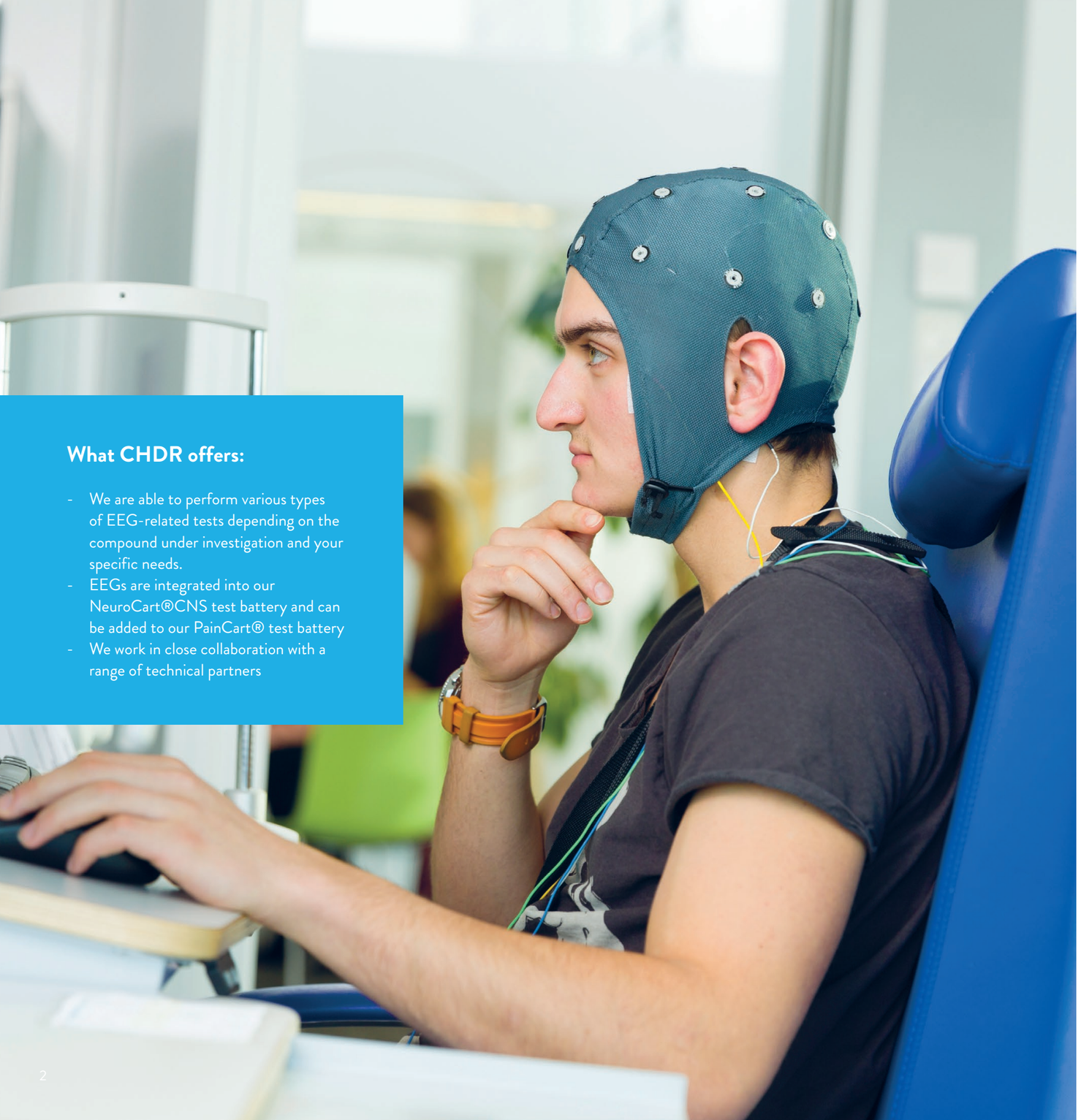
CHDR
Centre for Human Drug Research

Electroencephalography (EEG)



What CHDR offers:

- We are able to perform various types of EEG-related tests depending on the compound under investigation and your specific needs.
- EEGs are integrated into our NeuroCart®CNS test battery and can be added to our PainCart® test battery
- We work in close collaboration with a range of technical partners

Electroencephalography (EEG)

EEG recordings are of important added value in quantifying the effects of drugs targeting the central nervous system (CNS). CHDR has extensive experience in performing EEG recordings for research purposes in a wide range of neurological and psychiatric conditions.

Resting state EEG

Resting-state EEG is very sensitive to the effects of pharmacological substances on the brain. For this reason, pharmaco-EEG has become an established method for assessing drug effects on central nervous system (CNS) functioning. Examples of drug effects that can be detected with resting-state EEG include increases in the power of the β and γ bands and decreases in the power of α frequencies in response to benzodiazepine treatment, and increases in the power of the δ and θ bands during anaesthesia or following administration of 5-HT2 receptor antagonists.

Stimulus-related and task-related EEG

EEG recordings enable us to quantify the functional integrity of different brain areas. At CHDR, we perform a range of stimulus-related and task-related EEG measurements to study a range of responses, both sensory (auditory, visual, electrical, and heat) and cognitive (P300 and mismatch negativity). Polysomnography (PSG) is also used at CHDR to monitor various sleep characteristics and sleep architecture. With PSG, a panel of physiological parameters is recorded continuously throughout the night in order to obtain objective measures of sleep. PSG generally includes EEG, electrooculography (EOG), electromyography (EMG), electrocardiography (ECG), and respiration measurements.

EEG recordings are performed using:

- TMSi EEG amplifier consisting of up to 32 EEG channels, 4 bipolar channels (e.g. for EOG and EMG), 4 auxiliary (AUX) channels, an 8-bit DB25 connector, and a 1-bit BNC connector
- Custom-built EEG connector box (TMSi) for quick and simple connection of an EEG cap and additional sensors (e.g. EOG and EMG).
- TMSi Polybench software for signal acquisition and trigger registration
- Software developed in-house for accurate stimulus presentation
- Algorithms developed in-house for data processing and analysis

NeuroCart®

EEG is integrated into our NeuroCart® CNS test battery[1] and can be added to our PainCart® test battery.[2] Both NeuroCart® and PainCart® have been thoroughly validated in healthy volunteers using a wide variety of established CNS drugs. NeuroCart® offers clear advantages over other CNS test batteries, in that it provides both objective measures (e.g. neurophysiology) and subjective measures (e.g. cognitive function, memory, and mood) of CNS function.

High-quality assessments

Our dedicated clinical and technical staff are expert in the preparation and execution of EEG recordings. EEG recordings at CHDR abide by the *Guidelines for the Recording and Evaluation of Pharmaco-EEG Data in Man* set out by the International Pharmaco-EEG Society (IPEG).[3] The performance of all EEG recordings is guided by Standard Operating Procedures (SOPs) which are created and monitored according to strict quality assurance conditions.

To ensure a field-leading level of service, we work in close collaboration with a range of technical partners, including the Biomedical Signals and Systems (BSS) group and the Clinical Neurophysiology (CNPH) group of the University of Twente for the performance of intra-epidermal electrical stimulation (IES) and Transcranial Magnetic Stimulation (TMS), the Siesta Group for PSG, and NBT Analytics for innovative EEG analysis.

[1] https://chdr.nl/library/neurocart/download
[2] https://chdr.nl/library/paincart/download
[3] https://www.karger.com/Article/FullText/343478
[4] https://chdr.nl/detailed-videos/tms-eeg-emg
[5] https://chdr.nl/library/tms-eeg-emg/download

Stimulus-related and task-related EEG measures

CHDR offers the possibility to read out a wide range of stimulus-related and task-related neurophysiological responses, including:

- The endogenous **Event-Related Potential (ERP) P300** to reflect processes involved in stimulus evaluation or categorisation
- The **ERPs P50 and N100** to capture sensory gating, the process by which repetitive, redundant information is filtered to prevent flooding of the cortex with irrelevant information
- **Mismatch Negativity** to explore information processing in the healthy brain
- **Visual Evoked Potentials (VEPs)** to quantify the functional integrity of the visual cortex
- **Laser Evoked Potentials (LEPs)** to investigate the peripheral and central processing of nociceptive inputs
- Potentials evoked by **Transcranial Magnetic Stimulation (TMS)**[4,5] to clinically study the effects of drugs that are expected to affect nerve or corticospinal excitability
- Potentials evoked by **Intraepidermal Electrical Stimuli (IES)** to reflect the central sensitisation of nociceptive pathways

Why choose CHDR?

The Centre for Human Drug Research specialises in early-phase clinical drug research. CHDR's overall mission is to improve the drug development process by collecting as much information as possible regarding the candidate drug in the early phases of development. This information helps sponsors make informed decisions regarding the course of clinical development for their product.

Why choose CHDR?

Research at CHDR covers a wide range of fields, including the central nervous system (CNS) and pain, the cardiovascular system, haemostasis, immunology, and dermatology. In addition, CHDR is at the forefront in developing novel biomarkers and methods for measuring drug-related effects in all of these research areas.

Pharmacology matters

Whether studying a new cognitive-enhancing drug, a next-generation painkiller, or a new monoclonal antibody designed to treat rheumatoid arthritis, the goal is to determine how the compound's effects correlate with both the dose and blood concentration at any given moment. In addition, understanding which biological systems are activated is an essential first step towards quantifying this relationship. At CHDR, our focus on pharmacology is reflected clearly in what we call question-based drug development.

Question-based drug development

CHDR actively uses question-based drug development - or QBD - as a more rational approach to drug development compared to conventional approaches. QBD can be best described as a series of questions that are addressed throughout the process. These questions often seem simple enough, but failing to answer even one question - or even addressing the questions in the wrong order - can have dire consequences. Thus, using this approach can potentially save companies millions of dollars by helping predict a catastrophic issue early in the development process, before the more expensive latter stages (for example, large-scale clinical trials or the marketing phase).

From a general perspective, the most important questions are:

1. Does the biologically active compound and/or active metabolite(s) reach the intended site of action?
2. Does the compound cause its intended pharmacological and/or functional effect(s)?
3. Does the compound cause any unintended pharmacological and/or functional effect(s)?
4. Does the compound have a beneficial effect on the disease and/or clinical pathophysiology?
5. What is the compound's therapeutic window?
6. How does any variability with respect to the drug response in the target population affect the product's development?

Contact

To learn about CHDR's full range of services, contact us today.

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