Faculty of Science and Engineering

Profile report: Personalized Pharmacotherapy (Gepersonaliseerde Farmacotherapie)

- Discipline: Personalized Medicine/Pharmacotherapy, Genetics, -Omics, Pharmacology
- Level: Assistant professor (tenure track)
- Fte: Full time (1,0)

1. Scientific discipline
Central to the discipline Personalized Pharmacotherapy is the therapeutic risk stratification of patients based on the integration of knowledge on the drug profile with a patient's genetic, -omics and clinical/demographical profile. Best choices of selected drug therapies based on pharmacologic and pharmacogenetic information as well interactions with co-medications, notably in polypharmacy, is of growing scientific interest. Predicting responses based on knowledge on the causal pathway of diseases (so-called Systems Biology), in combination with advanced diagnostic tools as therapeutic drug monitoring, will lead to a better selection of pharmaceutical therapy. Further, the development, evaluation and implementation of targeted community or translational pharmacy interventions to improve optimal and sustainable medication use is crucial. The ultimate objective of the discipline is the individual optimization of benefit-risk profiles as well as the cost-effectiveness and implementation of drug treatments in an ageing society.

2. Vacancy
This position is opened by the Board of the Faculty Science and Engineering (PT/jd/20/00731) and will be embedded in the Groningen Research Institute of Pharmacy (GRIP), base unit PharmacoTherapy, -Epidemiology & -Economics (PTEE). The position falls within the framework of 'Career Paths in Science 4' ('Bèta's in Banen 4'). Please see link for [criteria and conditions](#).

3. Selection committee (BAC)
Prof dr. H.W. Frijlink, scientific director GRIP, chair
Prof. dr. K. Taxis, professor of pharmacotherapy/ dept director MSc Pharmacy
Prof dr. E. Hak, professor of clinical pharmacoepidemiology/ education director GRIP
Prof. dr. M. Schmidt, professor of molecular pharmacy
Prof. dr. R. Gosens, professor of pharmacology
External member: Prof dr. B. van den Bemt, professor of personalized pharmaceutical care (Radboud University)
Student-member: Victor Pera, student pharmacy/MPS
Advisors: H. Haagsma (HR advisor)
        R. van Calck (Scientific coordinator GRIP)
        Prof dr. J.G.W. Kosterink, professor of hospital pharmacy (UMCG)

4. Research area

Developments within the discipline Personalized Pharmacotherapy are fast and include, but are not limited to, increased technological developments to design novel pharmaceuticals as biologicals and therapeutic vaccines, nanotechnologies, and novel diagnostic and analytical tools to measure disease status or clinical drug effects. Moreover, digitalization of data and the availability of big health care databases have an increasing influence on drug development by individualization/stratification of its application and the detection of new possible indications for existing drugs (repurposing). Developments in genetics and biology have changed the field of one-size fits all drug therapies to pharmaceutical therapies that need to be prescribed to specific patient groups. Hence, stratified medicine or Personalized Pharmacotherapy is a discipline that is rapidly developing.

Personalized Pharmacotherapy uses markers at different levels of the human body system to predict the optimal balance of drug effect and safety for a specific person or patient group. This so-called Systems Biology approach requires the integration of data from the genetic field, metabolomics, proteomics, microbiomics as well as demographical, clinical and physical data. Apart from individual patient data, data from relevant larger cohorts are needed such as the Lifelines cohort and specific patient cohorts from various hospitals to conduct valid pharmaco-epidemiological and pharmaco-economic studies with the required statistical power. Data software structures and linkage systems, data sciences as predictive analytics (e.g. machine learning) and causal analytics are crucial to derive valid information to guide personalized pharmacotherapies. An increasing pharmaceutical demand for the application of diagnostic tools to guide drug dosing (e.g. liver or renal function diagnostics or pharmacogenomics, metabolomics, proteomics and microbiomics), necessity of prophylactic drugs (e.g. cholesterol, blood pressure or respiratory function measurements) or administration of vaccines is expected in the coming years and comes with potential for multidisciplinary top research. Currently the infrastructure with the linkage of Lifelines with the prescription database IADB.nl under the PharmLines Initiative as well as the investments in statistical/methodological expertise within the unit and as part of the Faculty theme DSSC enable the tenure tracker to develop and expand a vital research line.

5. Embedding: institute (and base unit)

The GRIP is positioned within the Faculty of Science and Engineering (FSE) and physically located within the University Medical Centre Groningen (UMCG) of the Faculty of Medical Sciences (FMS); hence, in an ideal position to benefit from collaborations between both faculties. Together with Medical Sciences, GRIP participates in the joint UMCG-FSE Research Institute GUIDE (Groningen University Institute for Drug Exploration). Pharmaceutical research within GRIP is multidisciplinary. It bridges the clinical and biomedical sciences on the one side and chemistry, mathematics (statistics) and physics on the other side. The interaction between the pharmaceutical sciences with these fundamental and clinical sciences offers excellent opportunities for cutting-edge research.

With this vacancy, GRIP's ambition is to further build on the scientific knowledge generated by the preclinical research groups (e.g. Molecular Pharmacology, Drug Design, Analytical Biochemistry), coordinated by a new center of Personalized Pharmacotherapy and Pharmaceutical Care. This center will be based on a drug life-cycle approach, and it will expand the conduct of biomarker discovery and validation using big health care data within pharmacy networks and hospitals to gain insights into the impact of drugs in vulnerable patient groups such as, for example, those on polypharmacy in real-life settings.

The candidate will be embedded in the GRIP research group PharmacoTherapy, -Epidemiology & -Economics (PTEE). Its 2020-2025 mission is "*Leading in Personalized Pharmacotherapy and Pharmaceutical Care by innovative research and education*". PTEE also participates in the research school GUIDE where the unit PTEE cooperates within the program of Real-world studies in PharmacoEpidemiology, -Genetics, -Economics, &-Therapy (PEGET), and the departments of Epidemiology and Clinical Pharmacy and Pharmacology (CPP) from the UMCG. It is foreseen that part of the position (0.4 fte) will be set in the CPP-UMCG with emphasis on research on personalized medicine.

In Personalized Pharmacotherapy various tools and methodologies are applied including genetic and biomarker (e.g. -omics) diagnostic tests, medical tests in combination with demographic and medical outcome data, as well as computational methodologies and informatics software. Novel applications of cost-effective Personalized Pharmacotherapy, however, need the conduct of valid real-world patient-based studies with big health care data and biological samples. To this aim, access to our in-house prescription databases VIPP and IADB.nl linked to the Lifelines cohort in the RUG-UMCG-Lifelines "PharmLines Initiative", and other databases such as Eurocat, GIANTT, Lareb, and NIVEL GP and hospital databases, is available at the University Groningen.

6. Local and (inter)national position

In the Netherlands, research and education in the area of Personalized Pharmacotherapy receives increasing attention and is currently carried out at several institutes, such as the University of Amsterdam, Radboud University, Leiden University Medical Center, UMCG and the GRIP institute of the University of Groningen. At the University of Amsterdam, Anke Hilse Maitland-van der Zee's research into personalized medicine has a main focus on asthma in children. At the Radboud University Bart van den Bemt's research group is a (inter)nationally recognized group on adequate medication use, medication adherence, medication waste and (cost-)effective pharmacotherapy. At the LUMC, Henk-Jan Guchelaars' group is focused on pharmacogenetics and –genomics. At the UMCG, Lambers-Heerspink's research is focused on personalized medicine with specific emphasis on biomarker analysis in relation to drug effects. In GRIP, research is combined from Pharmacogenetics, Clinical Pharmacoepidemiology, Pharmacoeconomics, to Molecular Pharmacology, Analytical Biochemistry and Clinical Pharmacy. The

research is embedded in a multidisciplinary life-cycle drug approach combining scientific knowledge from bench to bedside and *vice versa*.

Research collaborations exist with Lifelines, the inter-university Dutch Biomarker Development Center, the Groningen Data Science and Systems Complexity Center (DSSC), the Departments of Clinical Pharmacy and Pharmacology (CPP), Epidemiology and Genetics (UMCG). In addition, PTEE has strong (inter)national collaborations with amongst others the Central EUROCAT-network (birth defect registries covering one-third of all births in Europe), the EURODURG network, and the universities of Ghent and Boston.

Within the context of this vacancy a new Center of Personalized Pharmacotherapy and Pharmaceutical Care is considered. The candidate for the tenure track position in Personalized Pharmacotherapy will, together with the methodological/statistical tenure track position in Precision Drug Therapy, be instrumental in developing this center and integrating research and education from various angles. An important part concerns the formal establishment of a network of (hospital) pharmacies and nursing homes for academic research and education. Internationally, only few Western countries (e.g. USA, UK, Canada) have started integrating novel diagnostic tools and clinical prediction rules into actual pharmaceutical practice. The Pharmaceutical Care Network Europe (PCNE) and the European Society of Clinical Pharmacy (ESCP) are large networks enabling the conduct of innovative research, but Personalized Pharmacotherapy is at its infancy.

7. Expected contributions to research

The Tenure Track candidate is expected to extend his/her research program in the field of Personalized Pharmacotherapy. The research should compete on a worldwide level and lead to publications in top journals. Obtaining substantial external funding for PhD projects is crucial. Supervision of PhD students is an important part of the research activities. The research is expected to strengthen the existing efforts to integrate applied pharmaceutical research within GRIP and GUIDE in the program PEGET. Further, the candidate should contribute to the participation and integration of the basic disciplines in his/her research line.

8. Expected contributions to teaching

The candidate is expected to contribute to the teaching programs within the degree course Precision Medicine (under construction). He/she will be involved in development and/or teaching within the Pharmacy/Medical Pharmaceutical Sciences Curriculum with emphasis on Personalized Pharmacotherapy aspects for example, pharmacology, pharmacogenetics, polypharmacy, and will contribute to maintaining a good quality of the network of community pharmacies to enable high quality internships as well as research internships. The candidate will also be actively involved in the development of new courses and/or revision of existing courses. The coaching and supervision of bachelor-, master- and PhD-students are an essential part of the teaching tasks.

9. Expected contributions to the organization

The candidate is expected to have an active interest in and provide a positive contribution to the management and organizational tasks of the institute. At the level of the FSE and GRIP, the candidate will contribute to the organization of the faculty, for example by participating in working groups and committees, in the fields of teaching, research and management. The candidate will participate in relevant national and international organizations.