

Diagnostics and imaging

Study programme

General description

In the specialization Diagnostics and Imaging you will combine radiopharmaceutical sciences with bio-analytical sciences. Radiopharmaceutical sciences is a truly translational discipline in which (radio)chemistry, molecular pharmacology and imaging come together and where new radiopharmaceuticals are developed. Your classes will reveal how to design, synthesize and evaluate radiopharmaceuticals. Additionally, you can also specialize in the development of new bio-analytical methods for analyzing living cells and detecting biomarkers. Or you work on the quick and accurate (high-throughput) measurement of large numbers of biological samples, for example to test for performance-enhancing drugs in sport.

Programme components (EC)

The Master's programme in Drug Discovery and Safety is a two-year programme starting in September. The specialization Diagnostics and Imaging contains the following components (EC):

- Compulsory (core) courses (30-36)
- Major research project (42-60)
- Literature thesis and colloquium (12)
- Ethics and academic skills (6)
- Elective: minor research project; traineeship abroad/company; optional courses (6-30)

Course overview

Period	Month	Course (EC)	Category
1	Sep – Oct	Chemical biology (6) ADMET (6) Principles of pharmacochimistry (6) Translational Radiopharmaceutical sciences (6)	Compulsory core course Compulsory core course* Introductory course** Choice specialisation***
2	Nov – Dec	High-throughput screening (6)	Choice specialisation***
3	Jan	Adv. Analytical sci. in Drug-Related and Clinical Environments (6)	Compulsory course
4	Feb – Mar	Computational design and synthesis of drugs (6), Drug action (6)	Compulsory core course* Compulsory core course*
5	Apr – May	Protein Analysis (6) Advanced Radiopharmaceutical Sciences (6)	Choice specialisation*** Choice specialisation***
6	Jun-	Traineeship, literature study, optional course	

More information: www.vu.nl/dds

* At least 2 out of 3 compulsory core courses are obligatory. Computational design and synthesis of drugs is compulsory for this specialisation.

** *Principles of pharmacochimistry* only compulsory for students without prior background in pharmaceutical sciences.

*** Choose at minimum 12 EC

This overview can be subjected to alterations.

Every part of the programme, including the choice of optional courses, has to be discussed and agreed upon with the Master's coordinator and approved by the examination board.

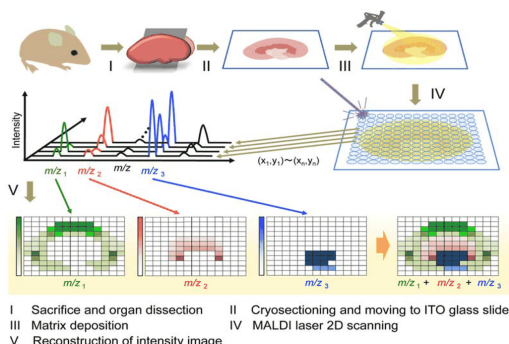
Master's coordinator: Dr. Henk Lingeman

Phone: +31 20 59 87539 E-mail: H.Lingeman@vu.nl

Prof. Dr. Govert Somsen; Dr. Jeroen Kool; Dr. Rob Haselberg

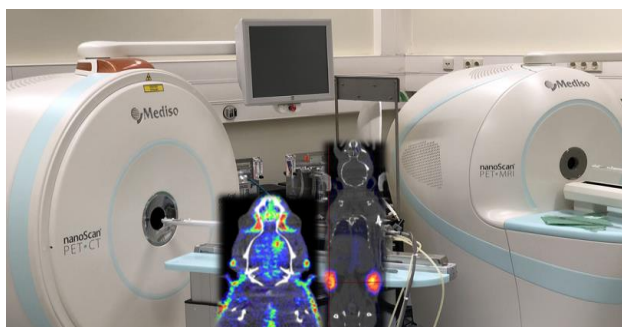
Analytics for assessing venom pathologies as basis for developing new snakebite treatments

Venom detection in organs after a snakebite requires elaborated and time-consuming approaches, such as tissue homogenization, purification and separation steps. The main drawbacks include loss of spatial information of substrates and/or venom components. In our studies combined data of the spatial molecular distribution of snake venom components in venom glands, and envenomed mice by mass spectrometry (MS) imaging in combination with histological images and data from the crude venom are used.



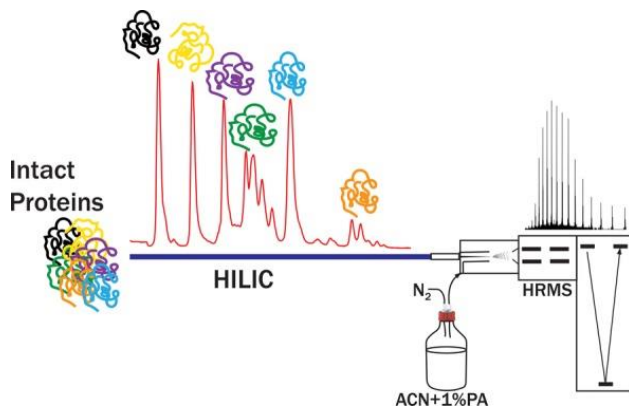
Selection and in vitro/in vivo evaluation of new biological targets

New lead compounds for PET imaging of a target compound of interest are synthesized. After lead finding, lead optimization on a small scale is performed. The optimal compounds are radiolabelled and investigated in vivo in collaboration with the radiopharmaceutical scientists. If no suitable PET tracer can be identified in vivo, new tracers will be designed and synthesized. In addition new biological targets (such as enzymes and receptors) are selected and in vitro evaluation is performed to determine the usefulness of the target for imaging. Furthermore, new PET tracers will be evaluated in vivo using state-of-the-art imaging equipment in parallel with in vitro techniques to confirm selectivity and specificity of a new tracer.



Capillary HILIC-MS: A new tool for sensitive top down proteomics

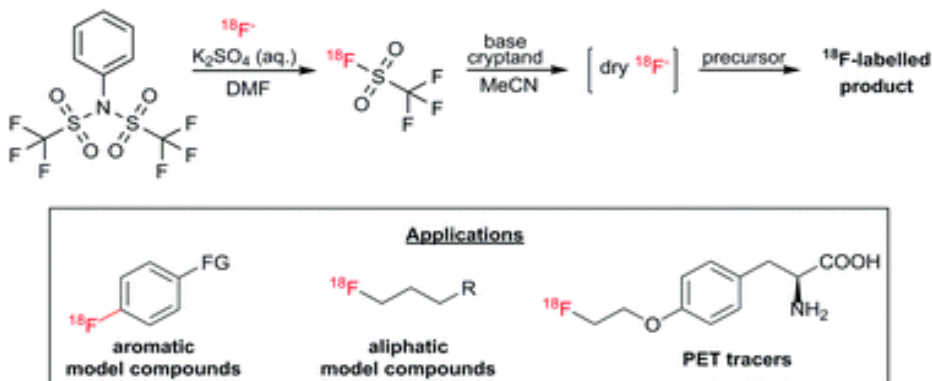
Recent progress in top-down proteomics has driven the demand for chromatographic methods compatible with mass spectrometry (MS) that can separate intact proteins. Hydrophilic interaction liquid chromatography (HILIC) has recently shown good potential for the characterization of glycoforms of intact proteins. In our studies we are showing that HILIC can separate a wide range of proteins exhibiting orthogonal selectivity with respect to reversed-phase LC (RPLC). However, the application of HILIC to the analysis of low abundance proteins (e.g., in proteomics analysis) is still hampered by low volume loadability, hindering down-scaling of the method. Moreover, HILIC-MS sensitivity is decreased due to ion suppression from the trifluoroacetic acid (TFA) often used to improve the selectivity.



Dr. Daniëlle Vugts, Dr. Alex Poot, Prof. Dr. Bert Windhorst

General radiopharmaceutical sciences

Radiopharmaceutical sciences is a truly translational discipline in which radiochemistry, organic chemistry, medicinal chemistry, molecular pharmacology and imaging come together and where new radiopharmaceuticals are developed from bench-to bedside. Your classes will reveal how to design, synthesize and evaluate radiopharmaceuticals and will develop you into a radiopharmaceutical chemist/scientist.



Development of new radiochemistry methodology to enlarge the radiochemistry toolbox

Our radiochemists develop new synthetic methods to be able to radiolabel any molecule of interest in the future. Right now the radiochemistry methodology available to synthesize radiopharmaceuticals is limited. The short physical half-life limits the chemical possibilities and fast, high yielding reactions therefore need to be developed. To this end, our radiochemists work in lead-shielded isolators developing new automated synthetic procedures for new radiolabelled building blocks and apply them in the synthesis of new imaging agents.



Synthesis of new PET tracers for imaging

Our radiochemists synthesize new lead compounds for PET imaging of a target of interest. After lead finding, lead optimization on a small scale is performed. The optimal compounds are radiolabelled and investigated *in vivo* in collaboration with the radiopharmaceutical scientists. If no suitable PET tracer can be identified *in vivo*, new tracers will be designed and synthesized.