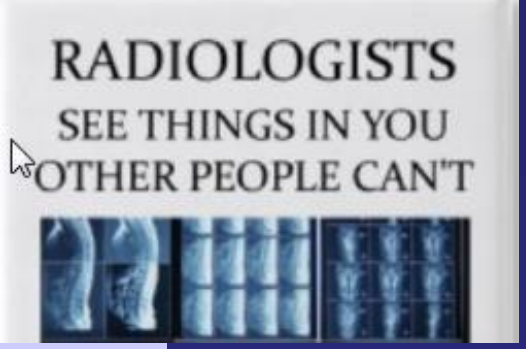
Collaboration MIC UMCG with BRASIL

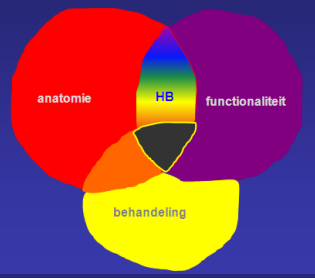
Rudi DIERCKX

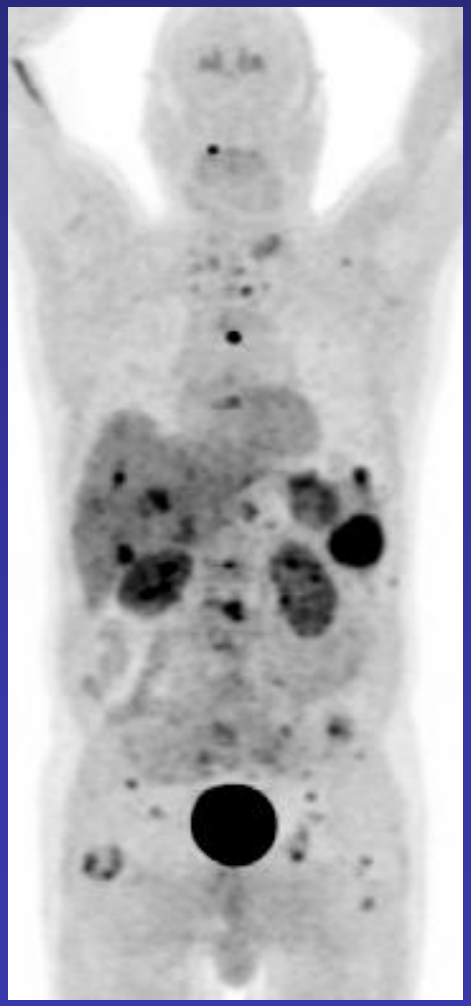
University Medical Center Groningen
Univesity of Groningen
The Netherlands

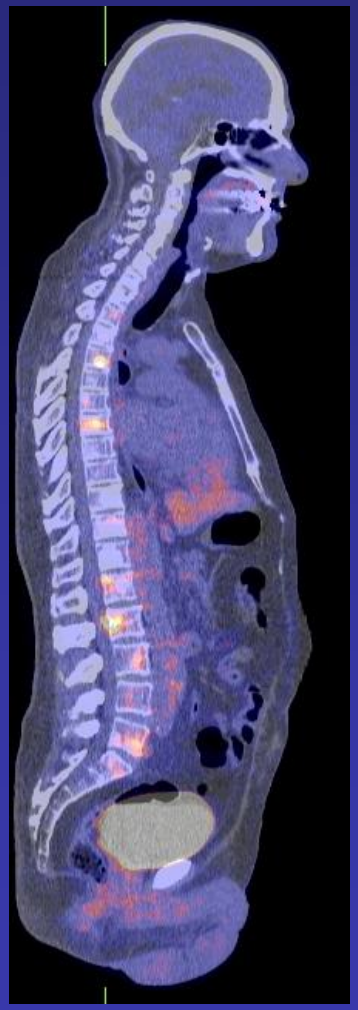


Medical Imaging Center

Medical Imaging Center UMCG
1 november 2013







FIGURES

Personeel : 320 fte + 50 PhD

40 medical specialists + 25 in training
6 medical physicists + 4 in training
5 (radio)chemists + 2 radiopharmacists
2 biologists
2 managers, 1 Q manager
surgeon, psychiatrists, organic chemist

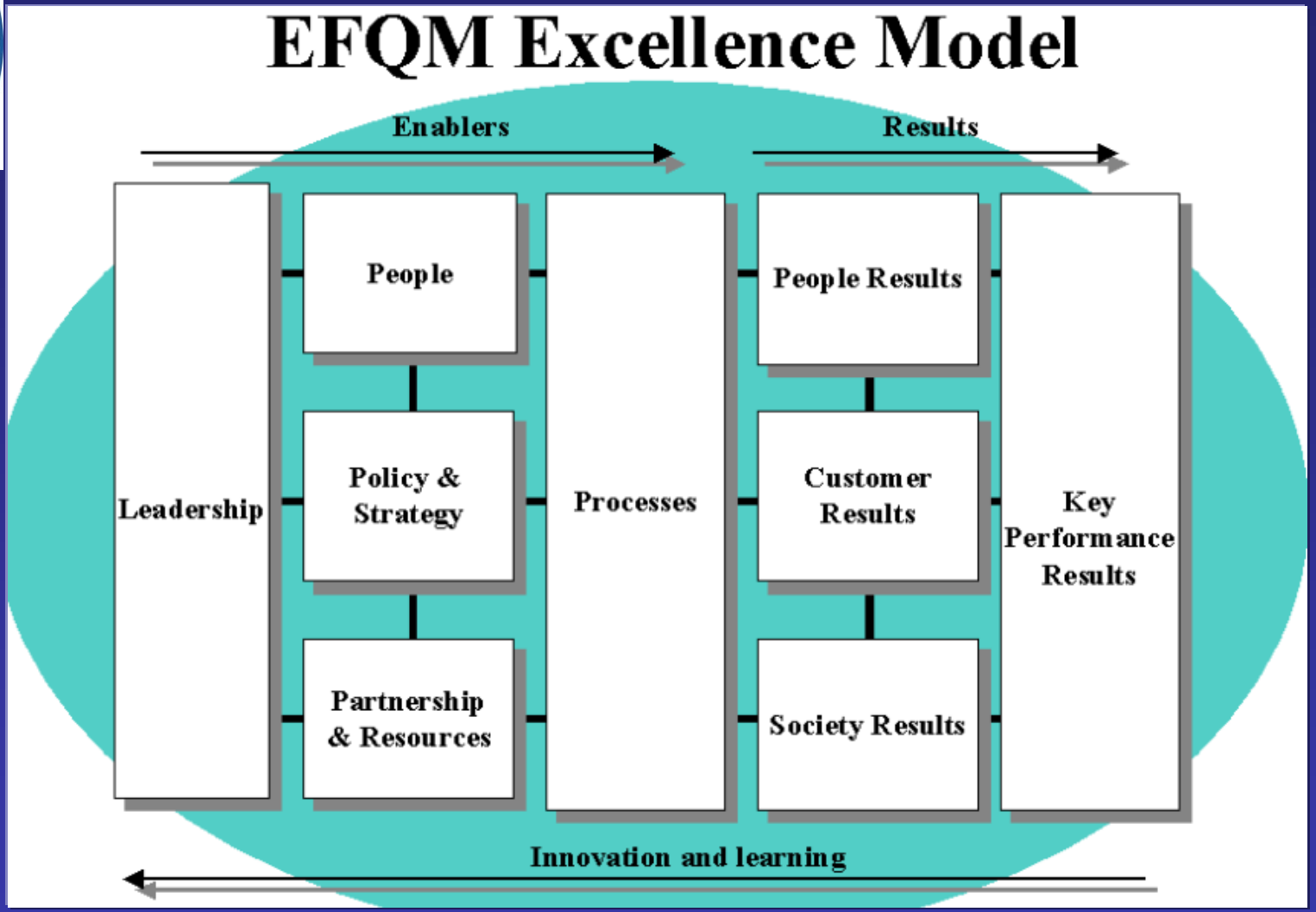
SYSTEMS

5 MRI : 3* 1,5 T en 2 * 3T
5 CT
2 PET-CT
2 SPECT-CT & 1 SPECT
2 Angio rooms
Bone densitometer
Echo, bucky, etc

Total +200,000

Bucky	123.300
CT	23.100
MRI	18.300
Interventions	4.800
Doorlichting	8.300
Echo	18.400
SPECT	8.000
PET	3.000
BDM	5000
RNT	150

INK/EFQM



Excellent companies balance organisation community environment

Cleanroom PET (GMP):

11 hotcells, 3 laminar flow cabinets

PET research lab:

6 hotcells, 8 shielded fumehoods

Cleanroom SPECT (GMP):

including a dedicated hot cell for ^{89}Zr labeling

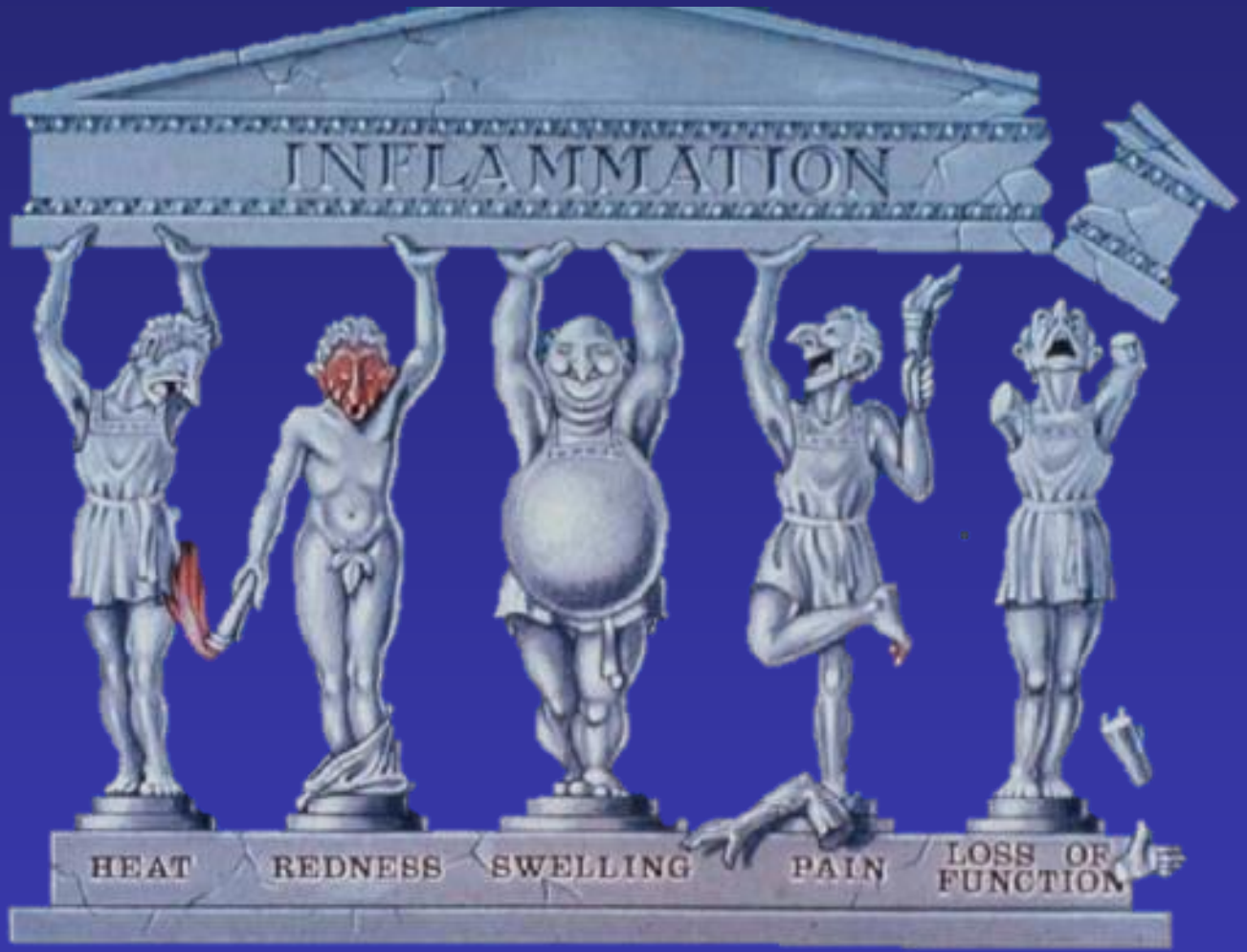
Research labs for long-lived isotopes, metabolite analysis and in-vitro experiments

Photo courtesy Dr J Pruim

PET tracers NMMI

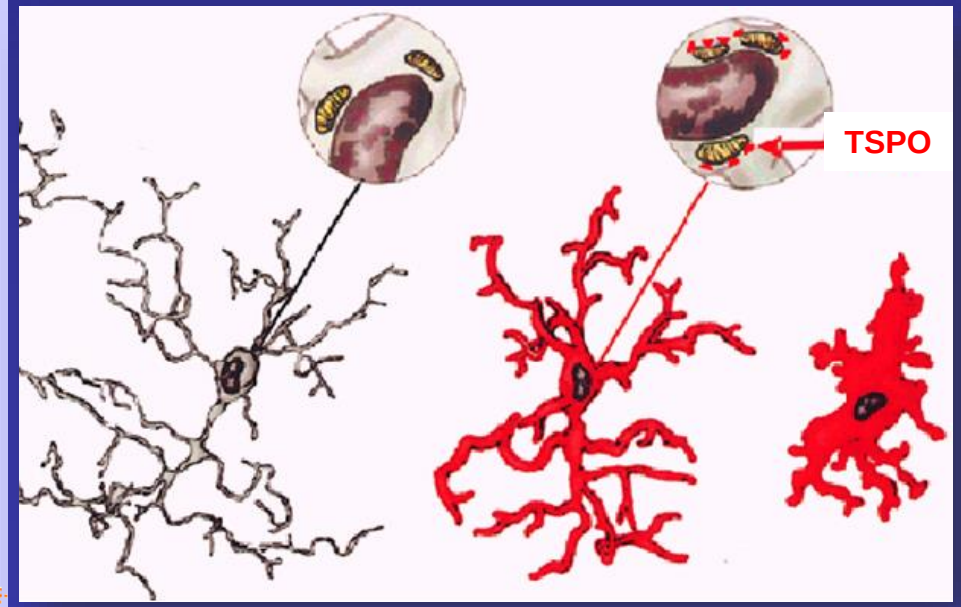
	Clinic and Human Research	Animal Research Only
Metabolic Activity	[^{11}C]-methionine, [^{11}C]-choline, [^{11}C]-HTP, [^{18}F]-DOPA, [^{18}F]-FDG, [^{18}F]-FLT, [^{18}F]-fluoro-D-methyltyrosine	[^{11}C]-thiothymidine
Hypoxia/Angiogenesis	[^{18}F]-FAZA, [^{18}F]-RGD-K5, [^{89}Zr]-bevacizumab	
Hormones	[^{18}F]-FES, [^{11}C]-metomidate	[^{18}F]-bombesine
Growth Factor Receptors	[^{89}Zr]-trastuzumab	[^{89}Zr]-cetuximab, [^{89}Zr]-GC1008, [^{89}Zr]-IGF-1RmAB, [^{89}Zr]-RO5323441
Dopamine	[^{11}C]-raclopride, [^{18}F]-DOPA	
Serotonin	[^{11}C]-MDL100907, [^{11}C]-DASB	[^{11}C]-HTP
Sigma Receptors	[^{11}C]-SA4503	[^{18}F]-FE-SA5845
Adenosine		[^{11}C]-MPDX
Acetylcholine		[^{11}C]-MP4A
P-glycoprotein	[^{11}C]-verapamil	[^{11}C]-MC18, [^{11}C]-MC244
Plaques	[^{11}C]-PIB	
Blood Flow	[^{15}O]-water	
Microglia/Macrophages	[^{11}C]-PK11195	[^{11}C]-DAA1106, [^{11}C]-DPA-713, [^{18}F]-DPA-714
T-lymphocytes		[^{18}F]-IL2
Metabolism	[^{18}F]-FDG	
Beta-adrenoreceptor	[^{11}C]-CGP12388	
Innervation	[^{11}C]-mHED	
Perfusion	[^{13}N]-ammonia	
Miscellaneous	[^{18}F]-NaF, [^{18}F]-FHBG	[^{18}F]-FEAnGA, [^{89}Zr]-alemtuzumab

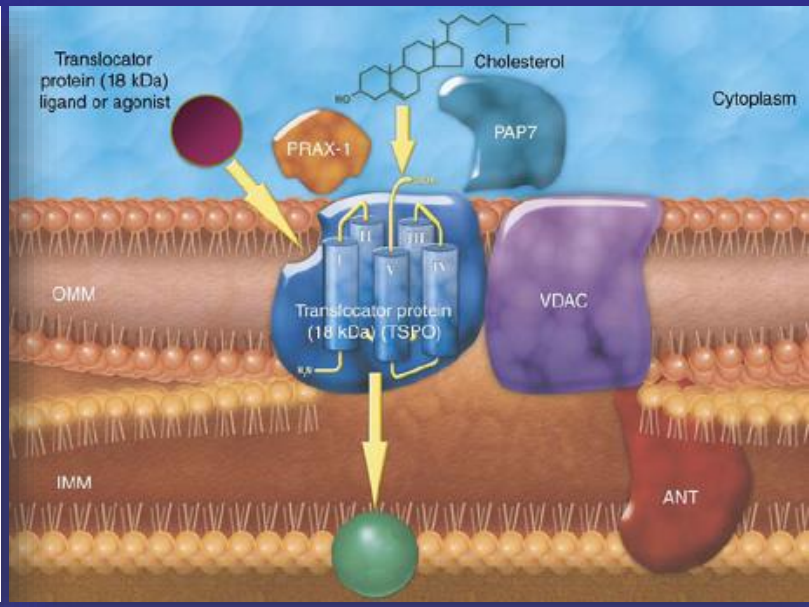
PET IMAGING OF INFLAMMATION



PET imaging of activated microglia

- Activation of microglia is accompanied by an increased expression of the translocator protein (TSPO)
- TSPO is an attractive target for imaging of microglia activation





PUSH

Partnership of UMCG – Siemens for building the future of Health

Research and Development Programme

Miljoenendeal UMCG en Siemens

DVHN | Gepubliceerd op 25 september 2014, 23:50
Laatst bijgewerkt op 25 september 2014, 23:52

GRONINGEN - Het UMC Groningen en Siemens hebben een vijftienjarig contr gesloten ter waarde van 135 miljoen e om samen nieuwe medische scanner en betere behandelingen van ernstige ziektes te ontwikkelen.

TECHNOLOGIE

Academisch Ziekenhuis Groningen wordt kraamkamer van scanapparatuur Siemens

Jan Verbeek
Groningen

Siemens gaat intensief samenwerken met het Universitair Medisch Centrum Groningen. De bedrijven worden strategische partners, die wetenschappelijke inzichten en medische apparatuur met elkaar delen.

Kern van de langjarige overeenkomst is dat het ziekenhuis de nieuwste medische scanapparatuur van Siemens gaat testen en gebruiken. Het gaat daarbij om beeldvormende systemen op het gebied van CT- en PET-scanners. Deze worden door medisch specialisten ingezet om chronische en levensbedreigende ziekten in een vroegtijdig stadium op te sporen. Zo wordt de levensduur van veel patiënten verlengd en kunnen de zorgkosten omlaag.

Siemens heeft vooral hoge verwachtingen van een geïntegreerde PET/MRI-scanner, de nieuwste lichaamsscanner die ook in Groningen zal worden geplaatst. De inset van die scanner moet leiden tot een doorbraak op het gebied van diagnostische beeldvorming.

Siemens wordt de innovatiepart-

le waarde van € 135 mln. Dat is in feite de prijs die het ziekenhuis betaalt voor het gebruik van de medische apparatuur en het servicepakket dat Siemens gedurende vijftien

Het Academisch Ziekenhuis UMCG (Universitair Medisch Centrum Groningen)

tuur wordt nu al geleverd door Siemens Healthcare. En nog dit jaar levert Siemens de grootste brandmeldinstallatie van Europa voor het medisch centrum.

mens levert, wordt in een vroeg stadium vervangen waardoor UMCG altijd over de laatste technologie beschikt.

Volgens bestuursvoorzitter Aart-

Medical Imaging Center, University Medical Center Groningen

2015 : CT

AS 64

FLASH

FORCE

Advanced systems	Expert system (R&D)
State-of-the-art clinical care	Ultra-low-dose screening

2015 : PET-CT

& Hologic

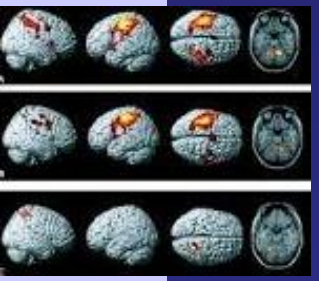
2016 : MRI

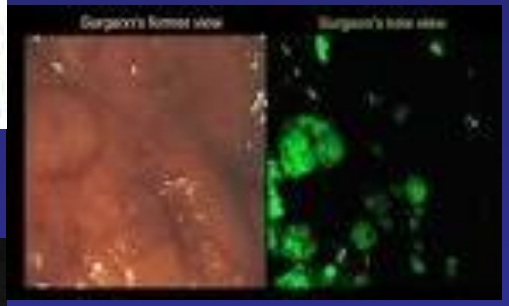
Skyra 3T

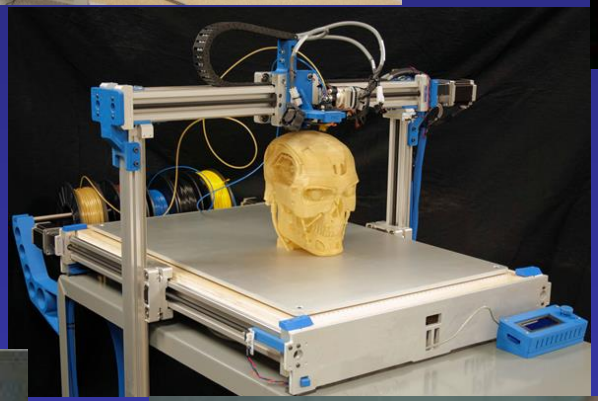
Prisma 3T

+ upgrade AVANTO FIT

THE FUTURE OF IMAGING - UMCG



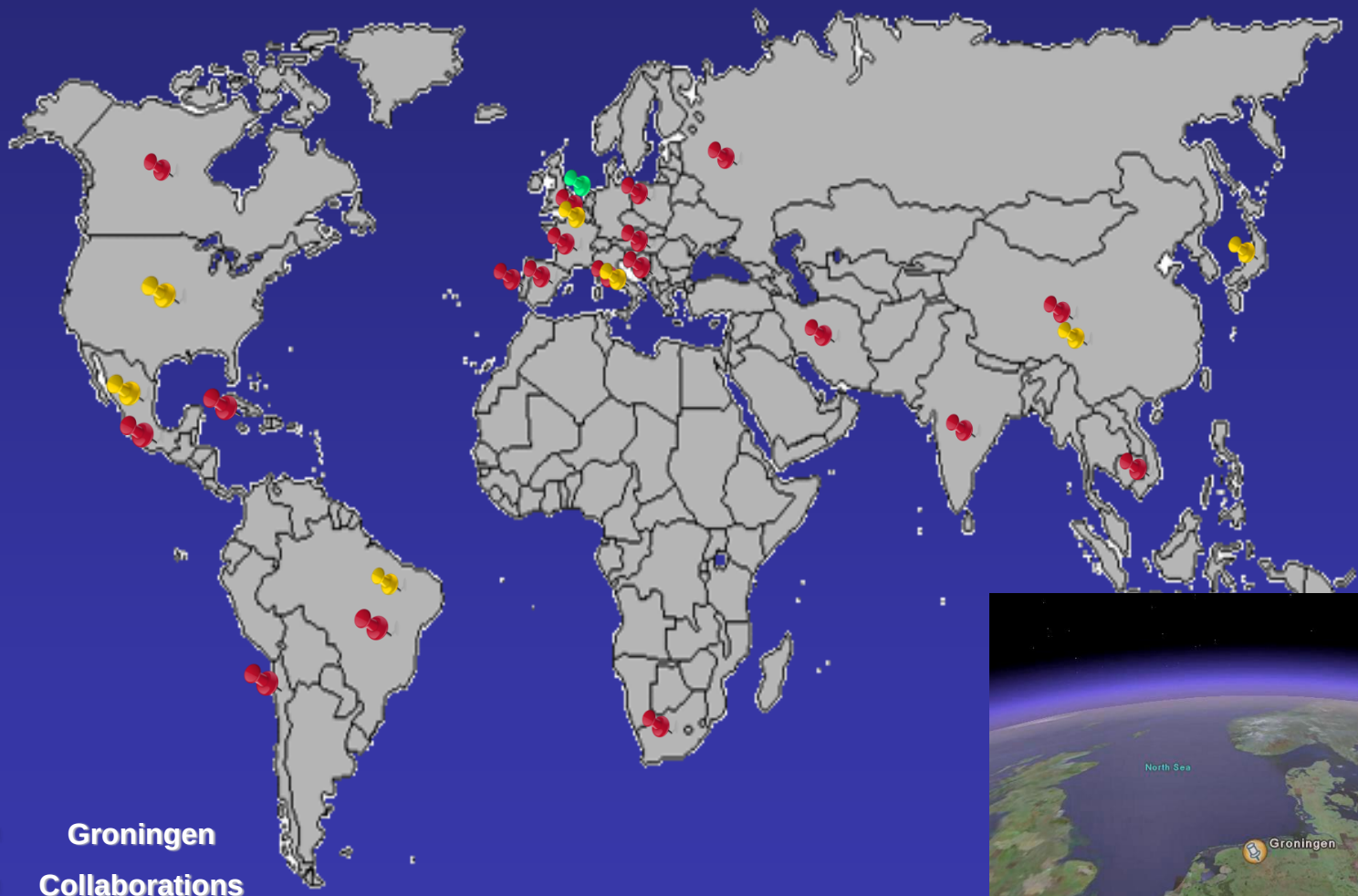




1 driver Lewis Hamilton of Great Britain stands next to a 3D
m during the Reebok launch of their new Smooth Fit
ogy.

MIC

AN INTERNATIONAL NETWORKSHAPER



Groningen

Collaborations

PhD-students

ALBERT EINSTEIN
INSTITUTO ISRAELITA DE ENSINO E PESQUISA
einstein

PUCRS
Pontifícia Universidade Católica do Rio Grande do Sul

Febr 17-22nd 2014

USP

University Medical Center Groningen, the Netherlands

Wagner	J.	jairo.wagner@einstein.br	Brasil	Hospital Albert Einstein
Edson	Amaro Jr	edson.amaro@gmaill.com	Brasil	Hospital Israelite Albert Einstein

Program Book

Medical Imaging of the Future: Consequences for Patient and Professional

Dr. Ana da Silva and dr C.M. Moriguchi Jeckel (PUCRS)

University Medical Center Groningen, the Netherlands

Staff ambassador UMCG - USP

Meet our Staff Ambassadors Brazil!

ATTP strategic partners in Brazil are *Universidade de São Paulo* (USP) and *Universidade Federal de São Paulo* in São Paulo (UNIFESP), and *Universidade Federal de Rio Grande do Sul* (UFRGS) and *Pontificia Universidade Católica de Rio Grande do Sul* (PUCRS) in Porto Alegre. Three researchers, each of whom were granted a Science without Borders Special Visiting Researcher grant to spend 1-3 months per year in Brazil, are responsible for managing the relations with these four Brazilian partners.

DR. ERIK DE VRIES

Erik de Vries of the Department of Nuclear Medicine manages relations with USP and PUCRS. Sandwich PhD students from both universities have already enrolled in the Abel Tasman Talent Program. He visits Brazil several times per year on a Science without Borders grant that was obtained by his colleague prof. dr. Carlos Buchpiguel of USP.

Read here an excellent article about the academic cooperation between USP and Groningen in Nuclear Medicine, our first sandwich PhD student who graduated early 2014, and the larger collaborative framework (in Portuguese).

IAEA Training program

IAEA fellows:

- 2013 Renato Arthur Benvenutti, Instituto de Pesquisas Energéticas e Nucleares (IPEN):

  Training PET tracer production

- 2015 Samira Marques de Carvalho, Brazilian National Nuclear Energy Commision (CNEN):

  Training in radioprotection and radiopharmacy

- *2016* Prof. dr. P.H. Elsinga

  IAEA training course in Sao Paulo

Science without Borders

- "PET imaging of disease-related processes in multiple sclerosis", Buchpiguel & de Vries
  - Vistiting Scienctist Dr. E.F.J. de Vries (2014-2016)

- Invited lectures and mini-courses (e.g. USP, IPEN, Brazilian Nuclear Medicine Congress):
  - Radionuclide production
  - Radiochemistry
  - Regulations
  - Brain imaging
  - Hormone receptors

Science without borders

XXVIII CONGRESSO BRASILEIRO DE MEDICINA NUCLEAR
26 a 28 SETEMBRO 2014
CENTRO DE CONVENÇÕES REBOUÇAS • SÃO PAULO

Menção Honrosa

Certificamos que o trabalho **"Utilização de [18F]FB-IL2 para imagem PET de linfócitos ativados em modelo de esclerose múltipla"** dos autores: DANIELE DE PAULA FARIA; Sjef Copray; Fabio Luiz Navarro Marques; Carlos Alberto Buchpiguel; Rudi Dierckx; Erik de Vries, foi selecionado como o melhor trabalho na categoria "Biomédico, Físico, Radiofarmacêuticos e Tecnólogos", apresentado oralmente durante o **XXVIII CONGRESSO BRASILEIRO DE MEDICINA NUCLEAR**, realizado de 26 a 28 de setembro de 2014, no Centro de Convenções Rebouças/SP.

São Paulo, 28 de setembro de 2014.

George Coura Filho
Presidente do Congresso

Juliano Cerci
Presidente da Comissão Científica

Realização SBMN

Parceria internacional do InRad beneficia produção local de radiofármacos

A Faculdade de Medicina da USP e o Centro Médico da Universidade de Groningen iniciaram em 2010 uma parceria para desenvolver projetos de pesquisa vinculados a programas de pós-graduação das duas instituições. Em janeiro passado, foi defendida a primeira tese desse programa por uma aluna brasileira, da área de Medicina Nuclear

A parceria se solidificou com o programa Ciência Sem Fronteiras, que permitiu a vinda a São Paulo, do Prof. Dr. Erik de Vries, professor associado da Universidade de Groningen, para contribuir com sua experiência para o início das atividades de produção do radioisótopo carbono-11, cujo objetivo é produzir radiofármacos para serem utilizados na área diagnóstico de doenças neurológicas, por meio de um projeto do Departamento de Psiquiatria (Prof. Dr. Geraldo Busatto) em colaboração com o InRad (Prof. Dr. Carlos Alberto Buchpiguel), com apoio financeiro da Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP).

A colaboração entre as universidades consiste de um acordo pelo qual estudantes brasileiros entram no programa de doutorado da Universidade de Groningen, permanecendo dois anos naquela instituição e dois anos na USP, com bolsas do governo holandês e brasileiro. No final, o aluno defende a tese na Universidade de Groningen e tem o título reconhecido pela Universidade de São Paulo.

Dra. Daniele de Paula Faria foi a primeira aluna a usufruir dessa parceria: "O Departamento de Medicina Nuclear deles estava recebendo estudantes para fazer esse doutorado 'sanduíche' e o Prof. Buchpiguel recomendou meu nome. O acordo inicialmente era entre as universidades, em seguida se transformou também em um acordo entre os departamentos de Medicina Nuclear", afirma. Sua tese foi intitulada "Advances in PET Imaging of Multiple Sclerosis, foi orientada pelos Profs. Rudi Dierckx e Carlos Buchpiguel e supervisionada pelo Prof. de Vries.

Sobre sua experiência, ela explica que foi um diferencial, e que hoje só é capaz de desenvolver algumas atividades na área porque foi lá e aprendeu: "Passei dois anos e meio na Holanda, começando em 2011, e foi uma experiência incrível. Groningen é um lugar muito bom para ficar, não apenas pelo lado profissional, mas também pelas pessoas. Foi uma experiência muito boa e eu aprendi muito!", afirma. Em julho de 2013, a profissional voltou ao Brasil, onde finalizou sua tese, e retornou a Groningen em janeiro para a defesa.

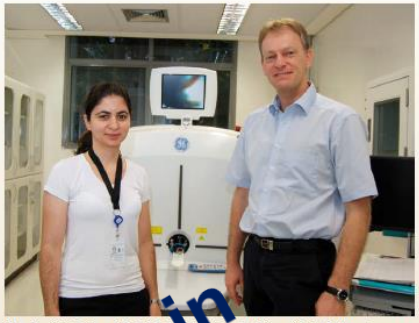
Formado em Química, com PhD em Química Orgânica, o Prof. de Vries entrou na Universidade de Groningen em 1996, onde se especializou em Radioquímica, e lá trabalha há 17 anos. Ele explicou que o programa da universidade holandesa busca estimular a troca de experiência com boas faculdades do exterior: "Nossa universidade considera a USP uma grande instituição, uma de nossas parceiras preferidas, e candidatos de várias áreas, não apenas de Medicina Nuclear, podem ir para nossa cidade para fazer parte do programa".

No momento, há um segundo aluno participando do programa de parceria com Groningen. O programa, considerado em início, já é visto pelo Prof. de Vries como altamente eficaz: "O critério de seleção, feito no Brasil, envolve candidatos excelentes. Temos estudantes de todo o mundo, de partes diferentes, e às vezes a qualidade que apresentam é questionável. Pela minha experiência, o Brasil é um dos países de mais se destaca. Para mim, pessoalmente é muito bom ter esse tipo de colaboração [com] estudantes do Brasil indo para Groningen", explica. A instituição pode receber [...] 40 estudantes por ano, mas nos anos [...] a quantidade de demandas chegou a ser [...] que a de vagas.

Paralelamente, o projeto do Prof. Dr. Geraldo Busatto, aprovado pela FAPESP, possibilitou a aquisição de equipamentos para a produção de carbono-11. Com ele, será feito um estudo clínico com pacientes de Alzheimer. A primeira produção será de um marcador para placa beta-amiloide, para Alzheimer (11C-PIB), que será também usado no projeto Ciência Sem Fronteiras, além do marcador de inflamação (11C-PK11195).

O principal propósito da visita do Prof. de Vries ao País foi transmitir um pouco de sua experiência e conhecimento para o grupo da Medicina Nuclear do InRad-HCFMUSP: "Além da minha experiência pessoal de 17 anos, nossa instituição tem quase 30 anos de experiência em estudos com radiofármacos para PET, então meio que sabemos o que pode dar certo ou errado quando você monta um novo site".

O Prof. de Vries afirma que trabalhar com o grupo da Medicina Nuclear tem sido uma experiência muito positiva para ele, e que entende que há muito potencial aqui: "Há experiência a



Dra. Daniele Faria e o Prof. Dr. Erik de Vries, da Universidade de Groningen, no Centro de Medicina Nuclear do InRad

ser adquirida, sobretudo agora com a produção do carbono-11, mas acho que todas as condições estão aí para se tornar um projeto de sucesso. Claro que há diferenças entre como as coisas são conduzidas aqui e na Holanda, mas isso já era esperado", ressalta.

No entanto, ele acredita que o progresso aqui deve ser mais rápido do que foi em sua universidade, no passado. "Quando comecei a trabalhar com radioquímica e PET, tínhamos que desenvolver basicamente tudo por nossa conta, descobrir os problemas sozinhos. Entidades como a USP, que começaram mais tarde, podem usar a experiência e o conhecimento de outros centros. Então, no caso do carbono-11, podem progredir muito mais rápido do que progredimos no passado", explica.

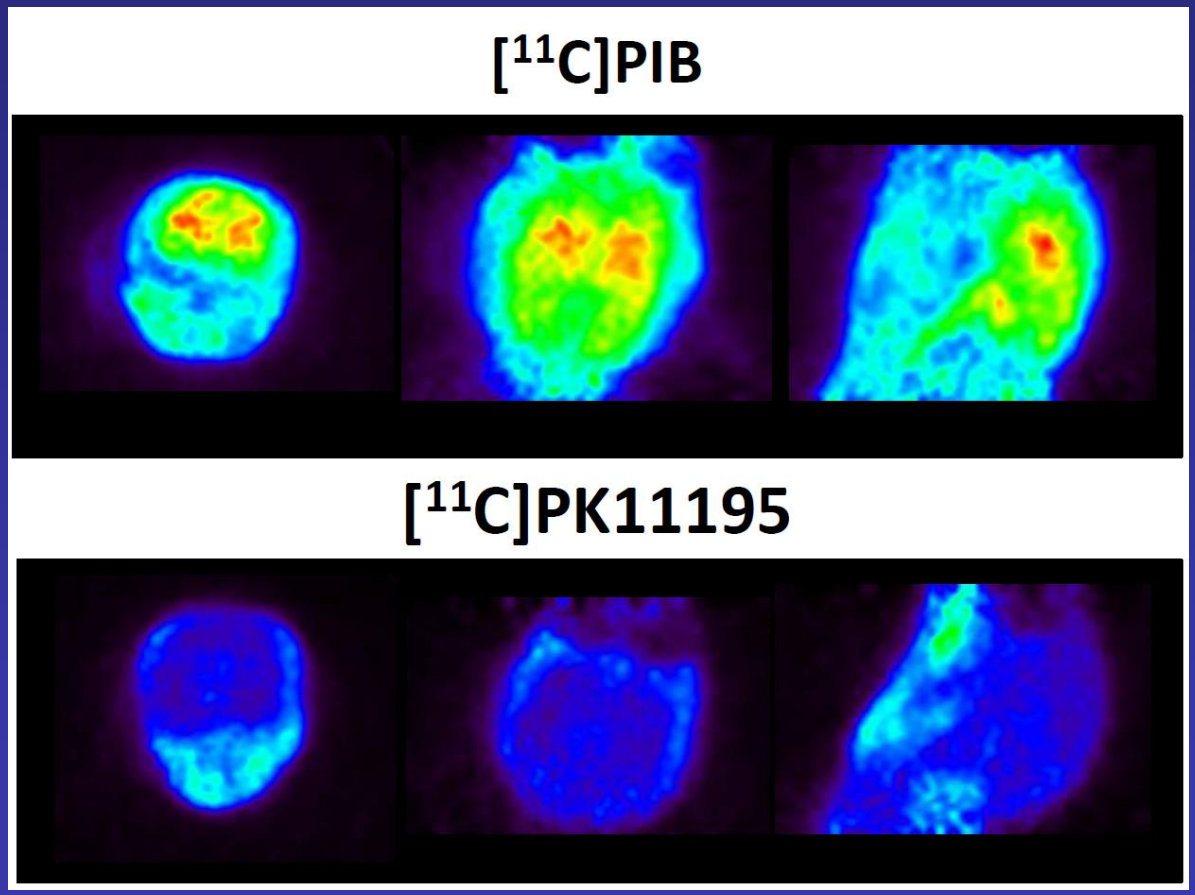
Dra. Daniele não tinha ainda apresentado sua tese e já foi contratada pelo ICESP em dezembro, apesar de atuar na prática no InRad: "Meu trabalho é no laboratório de pesquisas LIM 43. A produção do carbono-11 se dá no subsolo, e podemos aplicá-lo no laboratório de pesquisas, no segundo andar, com imagens pré-clínicas. Estudos

CONTINUA

First 11C production in Brasil!

17-6-2016

Science without Borders: First Marmoset brain images



Collaboration: NMMI – Sao Paulo

Joint PhD students (Abel Tasman talent program):

1. Myeline imaging, Daniele de Paula Faria (2011 – 2013)
2. Neuroinflammation in Schizofrenia, Alexendre Shoji (2012 – 2014

Postdocs:

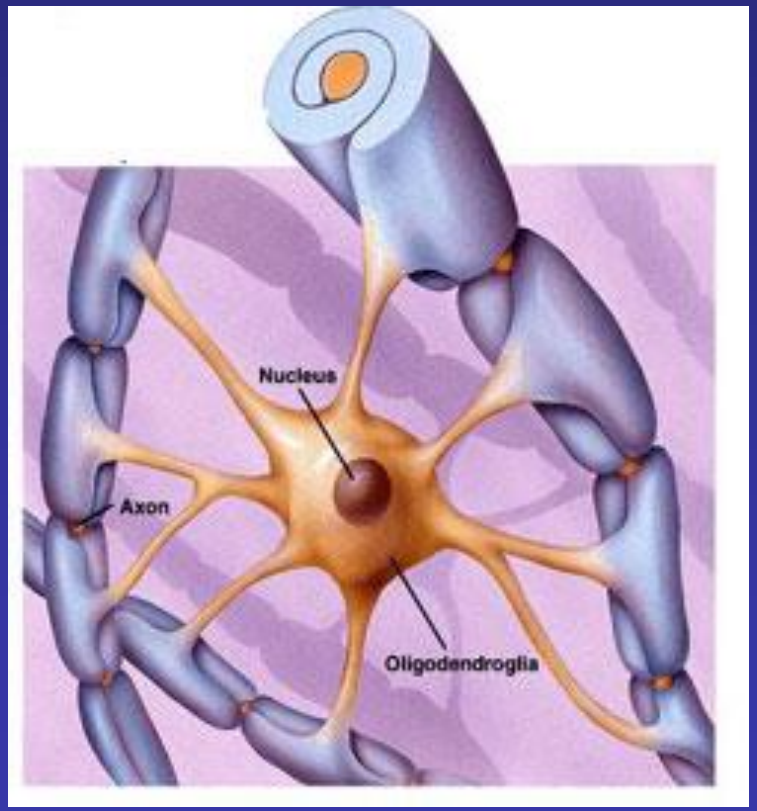
1. P-glycoprotein, Marcel Benadiba (2011)
2. Labeling 18F-Losartan, Emerson Soares Bernardes (2012)
3. Effect exercise on neuroinflammation, Caroline Cristiano Real Gregório (2015

Joint USP – UMCG PhD project Daniele de Paula Faria

University Medical Center Groningen, the Netherlands

Myelin

- Myelin form a protective layer around neuron
- In the CNS, myelin is produced by oligodendrocytes
- In MS, oligodendrocytes and myelin are destroyed

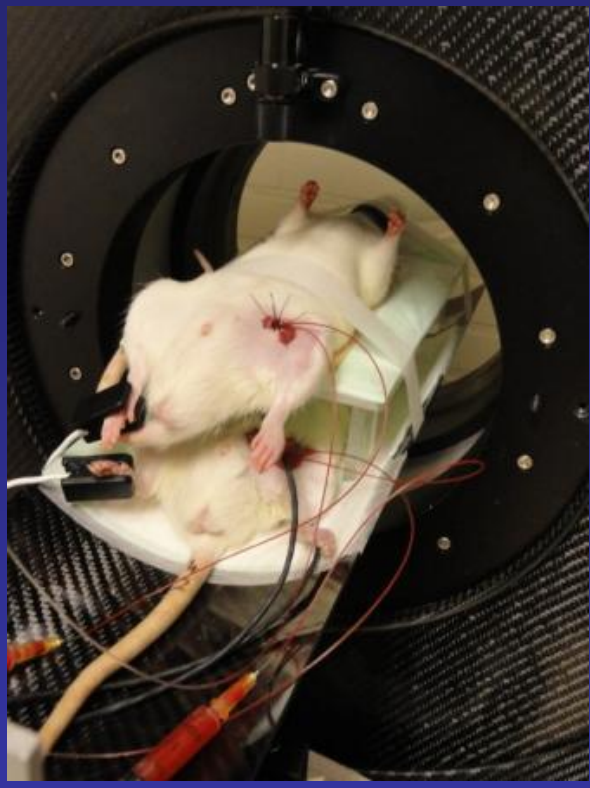


Lysolecithin rat model

Male Sprague-Dawley rat

Stereotactic injection:

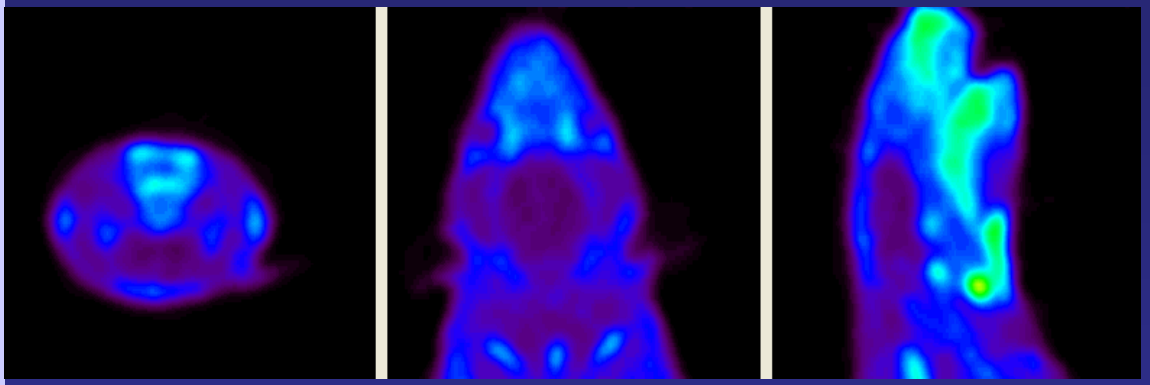
- Saline
- Lysolecithin 1%



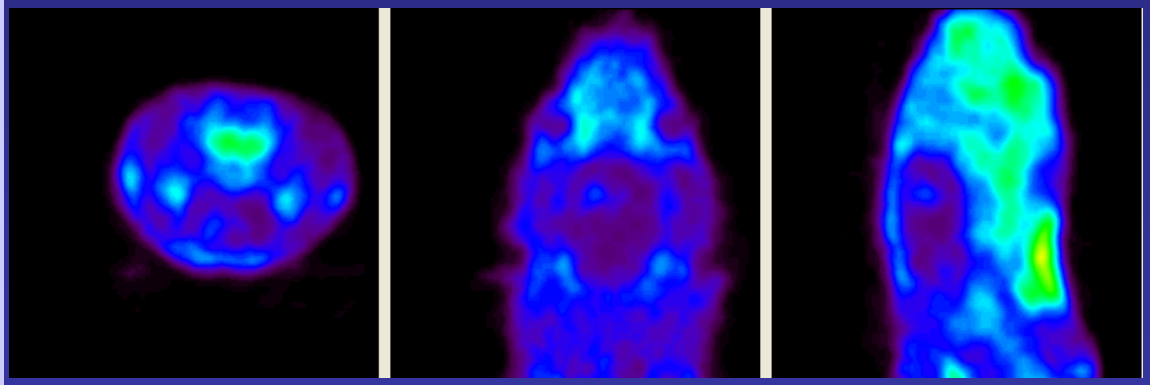
Dynamic PET scan + blood sampling

- Day 3
- Day 6-7
- Day 28-30

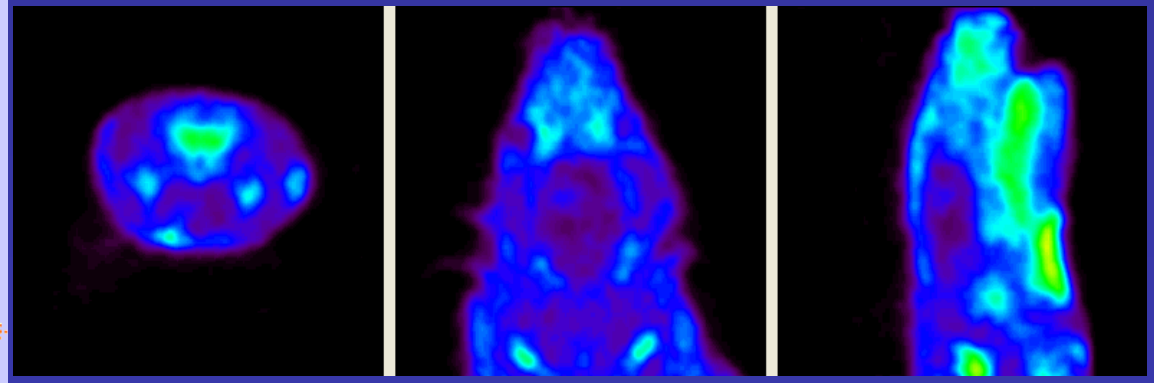
Lysolecithin model: [^{11}C]PK11195 PET



Control (day 3)

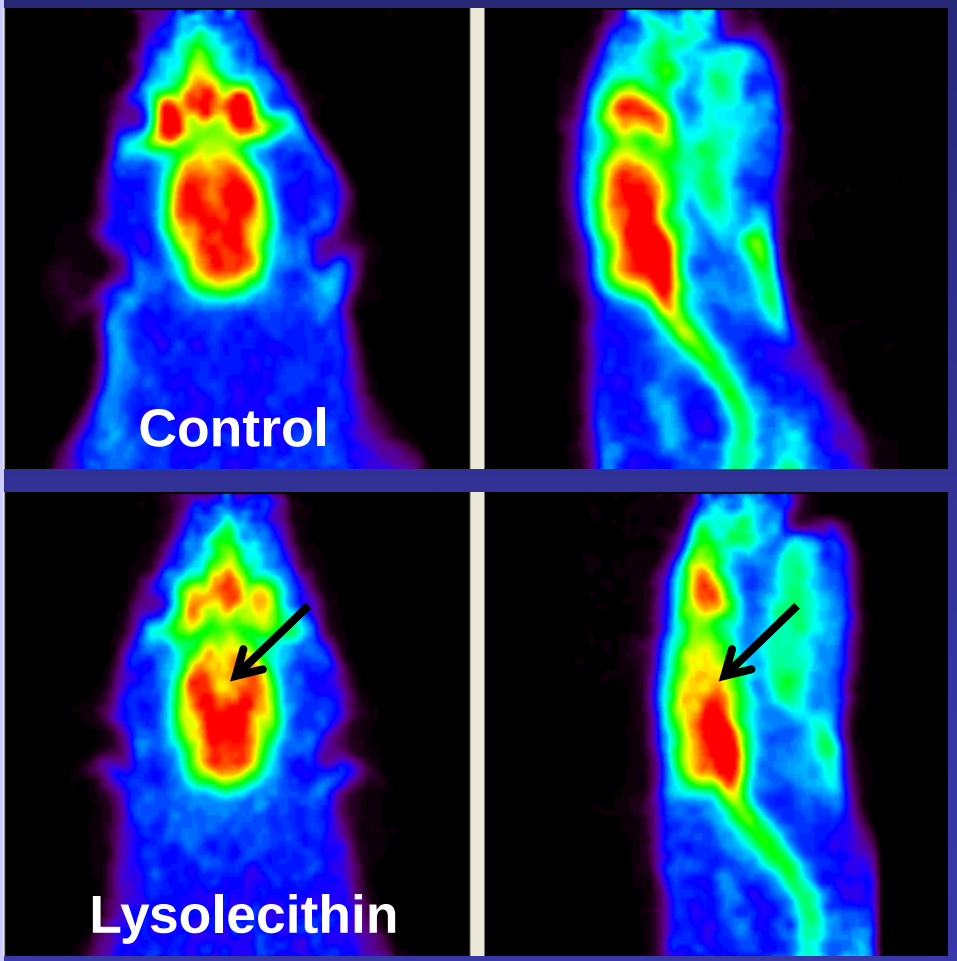


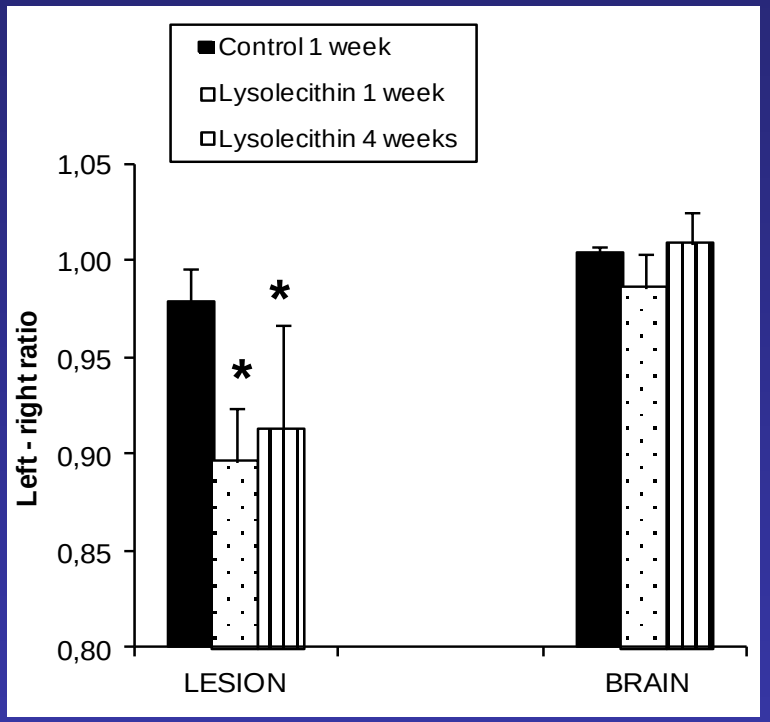
Lysolecithin (day 3)



Lysolecithin (day 7)

Lysolecithin model: [^{11}C]MeDAS PET





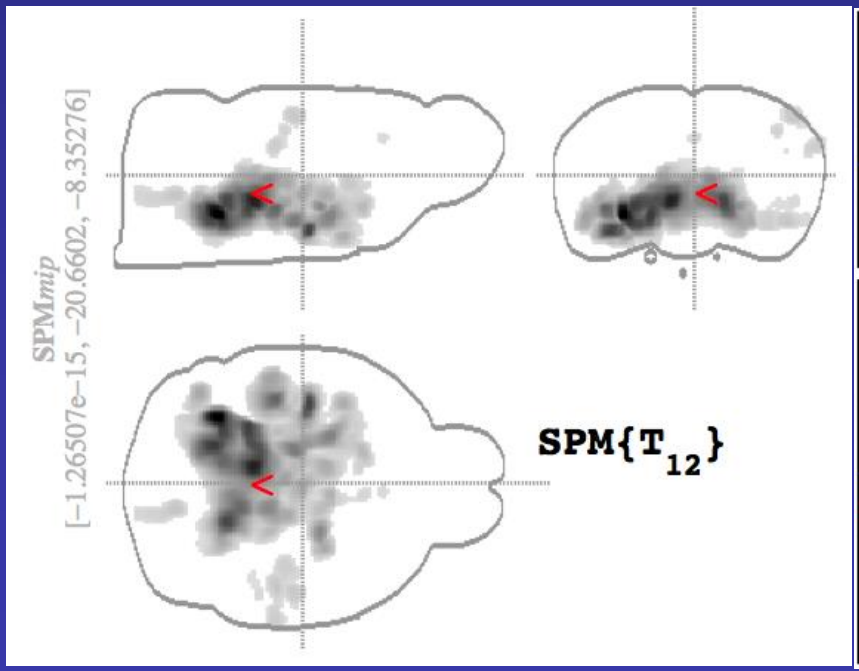
- ROI for lesion site based on immunohistochemistry
- IHC: little remyelination after 4 weeks

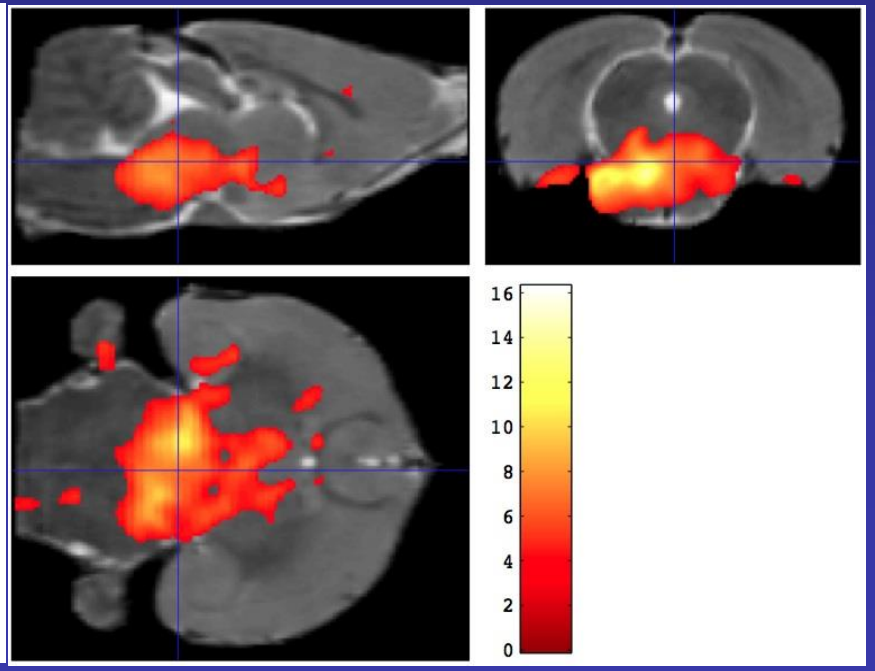
Alexandre Shoji

PK11195 PET:

Clozapine – but not haloperidol –

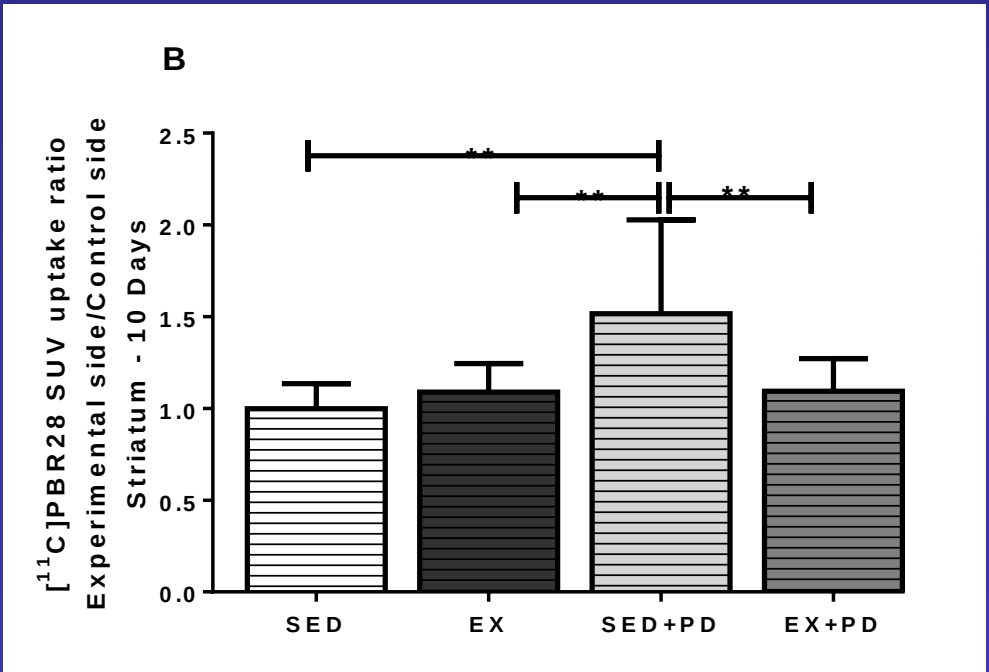
has anti-inflammatory properties in the HSV encephalitis model in rats





Caroline Real Gregorio

- Beneficial effect of exercise in a PD rat model
  - Exercise prevents neuroinflammtion (PBR28 PET) and dopaminergic degeneration (FDOPA PET)



SED = sedentary

EX = exercise

PD = Parkinson's disease

Project dr. Marcel Benadiba

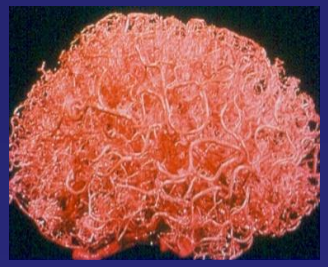
Clinical Pharmacologist,
PhD at University of São Paulo

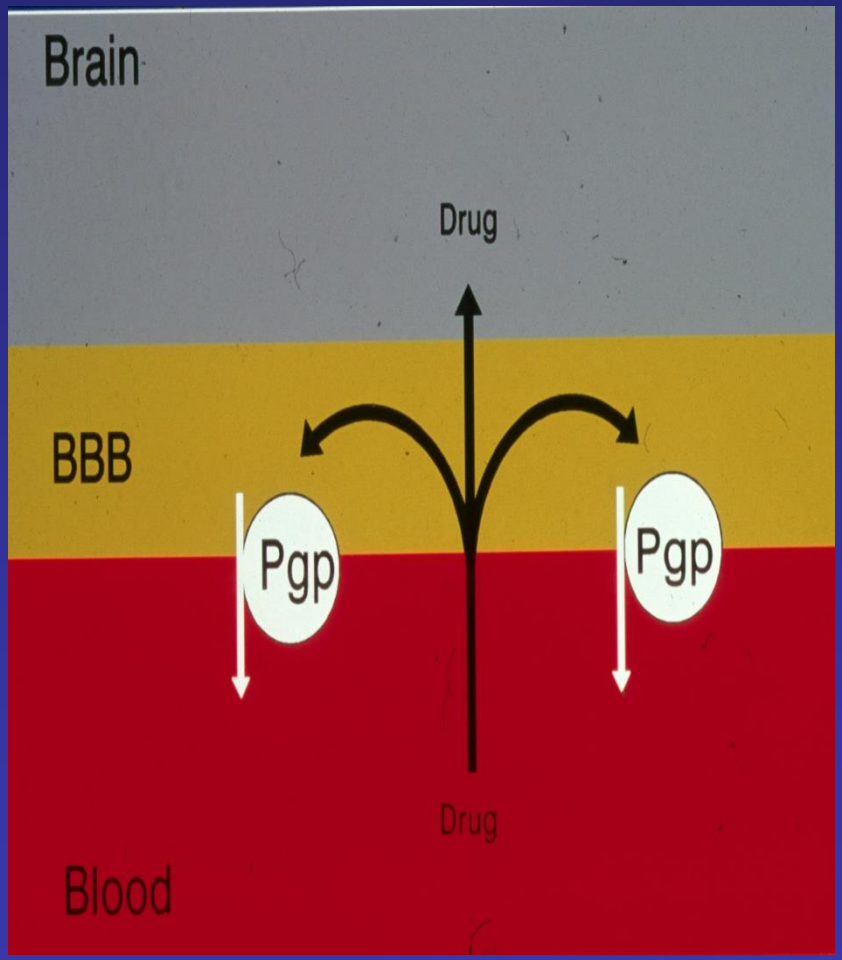
Start March 2012- end 2013

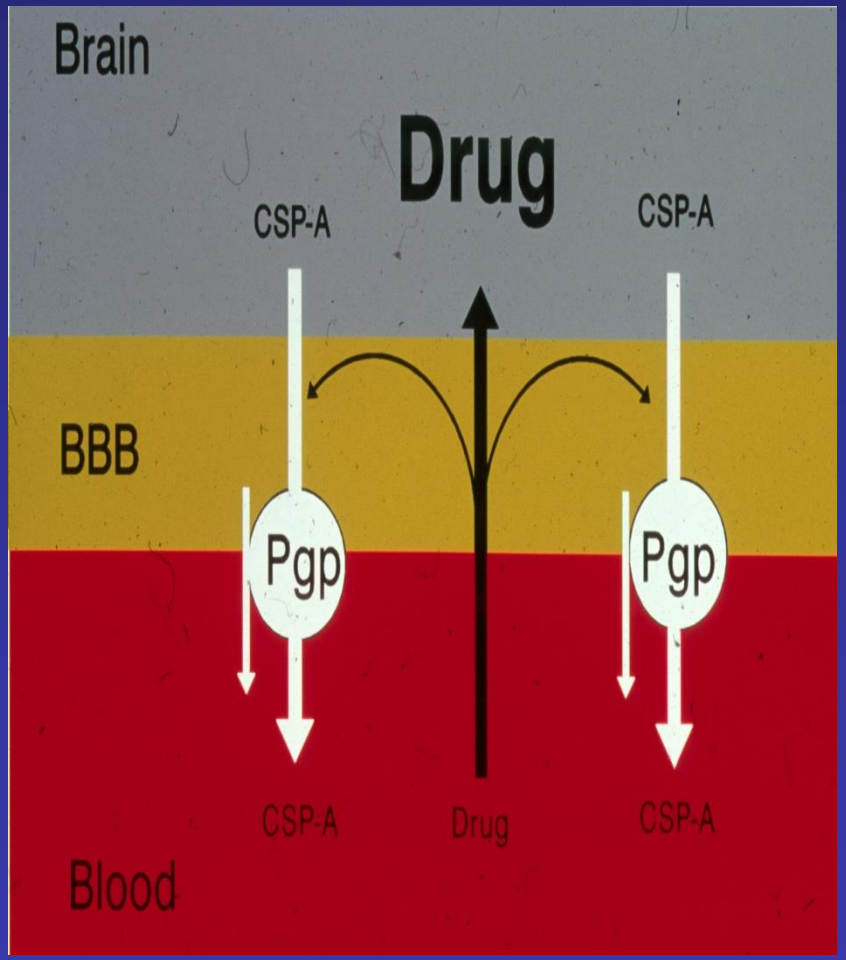
Project UMCG
"Development and evaluation of tracers for assessment of ABC transporters at the blood – brain barrier"

Supervisor; dr. Gert Luurtsema

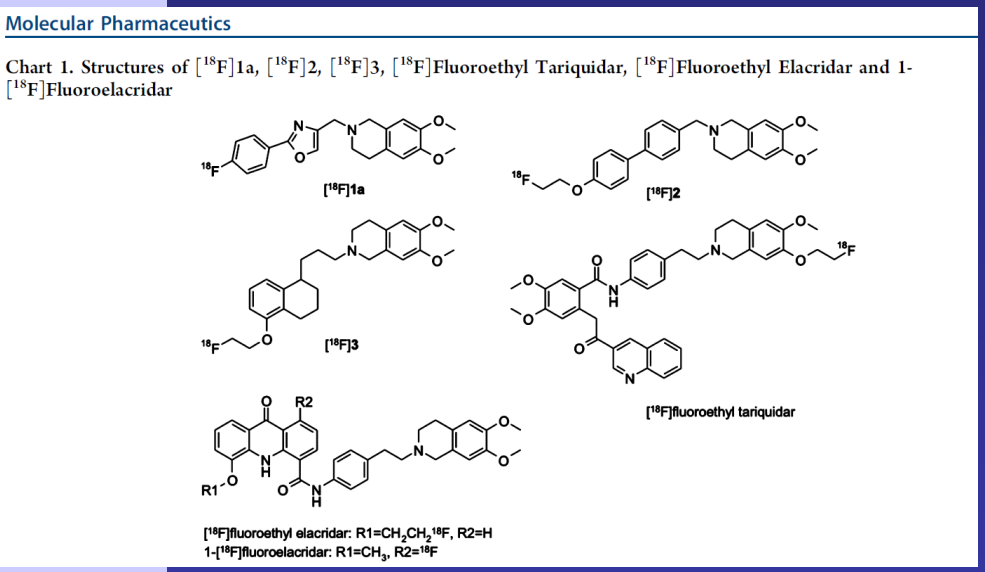
P-glycoprotein: modulation

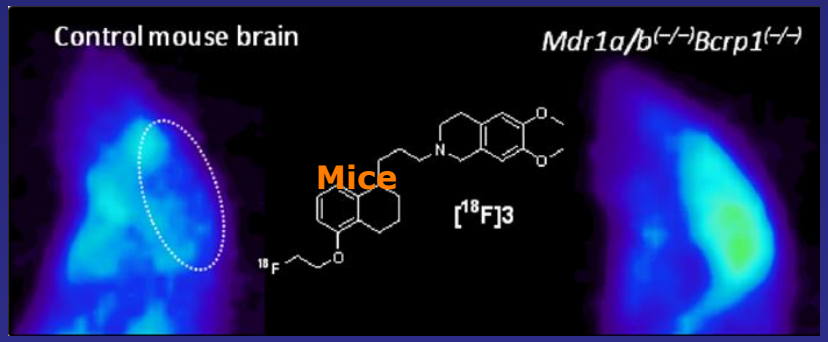


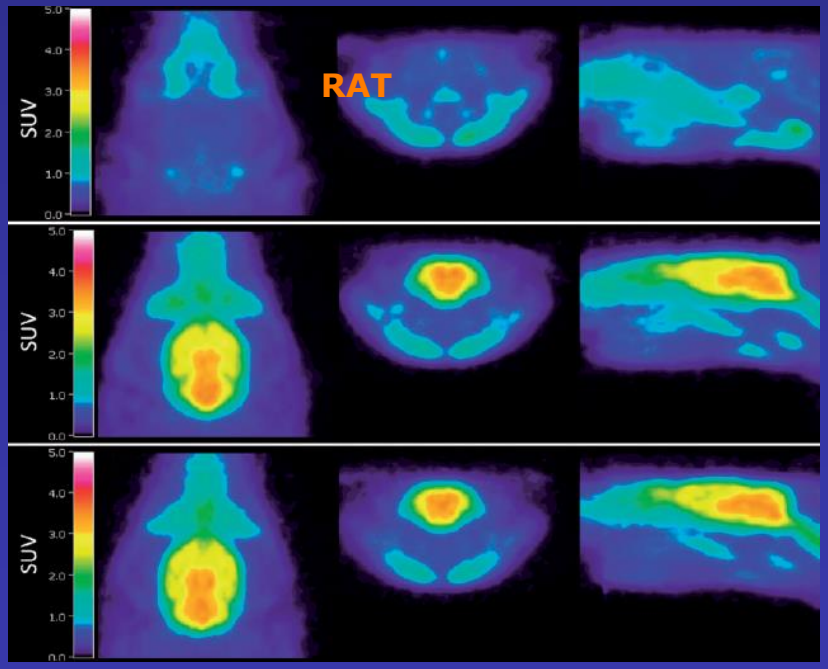




In vivo screening of new PET Tracers





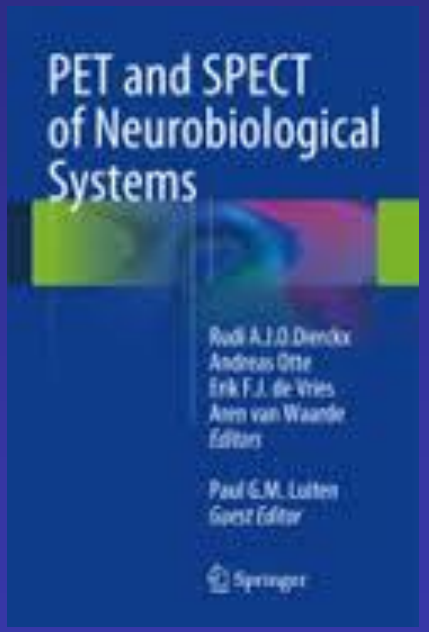


Output

1. (11)C- and (18)F-Labeled Radioligands for P-Glycoprotein Imaging by Positron Emission Tomography.
   Cantore M, Benadiba M, Elsinga PH, Kwizera C, Dierckx RA, Colabufo NA, Luurtsema G.
   ChemMedChem. 2016 Jan 5;11(1):108-18. doi: 10.1002/cmdc.201500420. Epub 2015 Nov 13.
   PMID: 26563728

2. New perspectives in nuclear neurology for the evaluation of Parkinson's disease.
   Benadiba M, Luurtsema G, Tumas V, Buchpigel CA, Busatto GF.
   J Parkinsons Dis. 2013 Jan 1;3(3):301-23. doi: 10.3233/JPD-130207. Review.
   PMID: 23981822

3. New molecular targets for PET and SPECT imaging in neurodegenerative diseases.
   Benadiba M, Luurtsema G, Wichert-Ana L, Buchpigel CA, Busatto Filho G.
   Rev Bras Psiquiatr. 2012 Oct;34 Suppl 2:S125-36. Review. English, Portuguese.
   PMID: 23429844 Free Article



PET Imaging of ABC transporters in the blood-brain barrier.

M. Benadiba, H. Savolainen, A.D. Windhorst, N.A. Colabufo, A. van Waarde and G. Luurtsema,

PET and SPECT of Neurobiological Systems. 2014

Collaboration: NGMB – PUCRS

Joint PhD students (Abel Tasman talent program):

1, Neuroinflammation in depression / social defeat

Paula Kopschina Feltes (2014 – 2016)

2, Image quantification

Isadora Lopes Alves (2014 – 2016)

3, Interaction between diabetes and neurodegeneration

Luiza Reali Nazario (2016 – 2018; just started in Brazil)

Master project: PET imaging in Zebrafish

4, Interaction neuroinflammation, BDNF and behavior

Bruno Lima Giacobbo (to be accepted)

PUCRS
Pontifícia Universidade Católica do Rio Grande do Sul

University Medical Center Groningen

rijksuniversiteit groningen

Working title:

The role of neuroinflammation in the development of major depressive disorder: a PET imaging study

Paula Kopschina Feltes

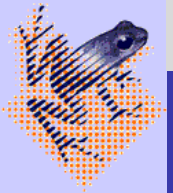
Abel Tasman Talent Program

Promotor: Prof. Dr. R.A.J.O. Dierckx , C.M. Moriguchi Jeckel (PUCRS)

Supervisors: Dr. E.F.J. de Vries, Dr. J. Doorduin (UMCG)

May, 2016

Ch.	Title	Status
2	Review: Anti-inflammatory treatment for Major Depressive Disorder: implications for patients with elevated immune profile and non-responders to standard antidepressant therapy	Under revision by supervisors
3	Effects of repeated social defeat on neuroinflammation and brain metabolism: A PET imaging study	Under revision by supervisors
4	Pharmacokinetic analysis of [^{11}C]PBR28 in the rat model of herpes encephalitis: comparison with (R)-[^{11}C]PK11195 for pre-clinical imaging and quantification of neuroinflammation	Published in JNM
5	The neuroinflammatory, metabolic and behavioral response to recurrent psychosocial stress: A [^{11}C]PBR28 and [^{18}F]FDG PET imaging study in stress-sensitized aged rats	Analyzing data
6	Development of a novel positron emission tomography (PET) tracer for non-invasive imaging of the inflammasome activation	Performing animal study
7	Comparison of dopaminergic D2 receptor levels in aggressive and non-aggressive Long Evans rats with [^{11}C]raclopride	Animal experiments finished
8	Samenvatting	
9	Conclusions and Future Perspectives	



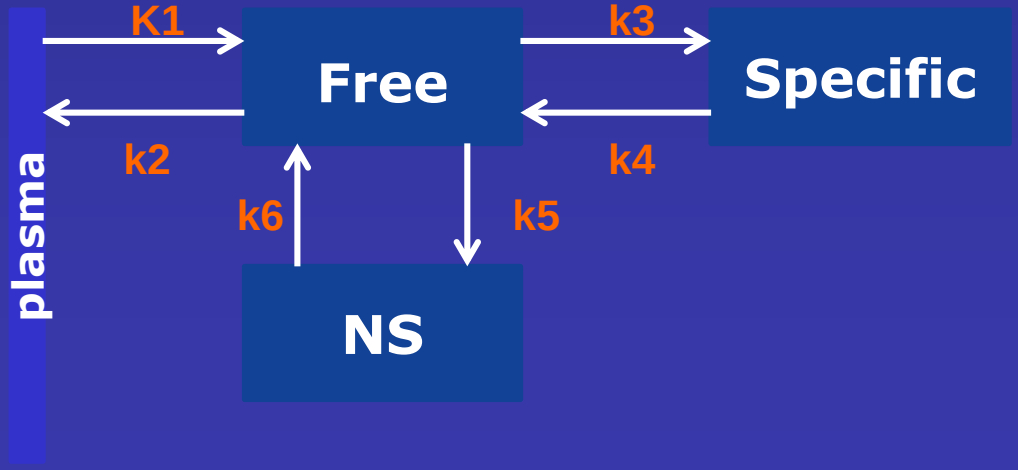
Working title:

Quantitative brain PET imaging: opportunities and limitations

Isadora Lopes Alves
Abel Tasman Talent Program

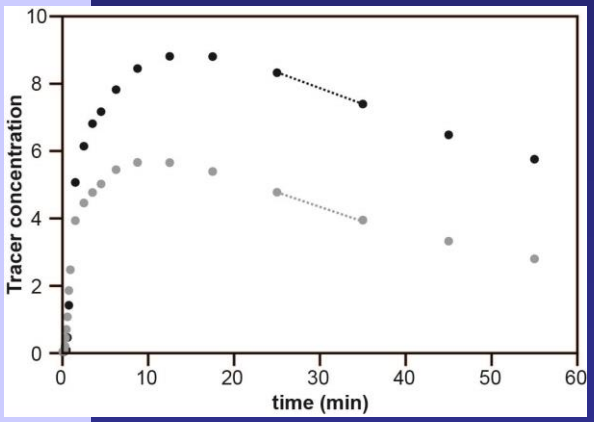
Promotor(s): Rudi Dierckx, Ana M. M. da Silva

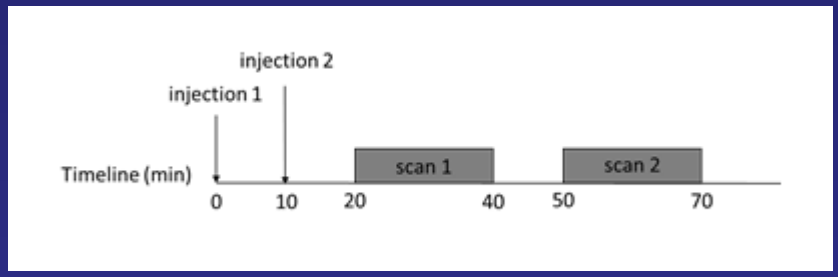
Supervisor(s): Michel Koole, Antoon Willemsen, Ronald Boellaard



AIMS OF PROJECT

1) Making PET protocols ***faster*** and ***more accessible***



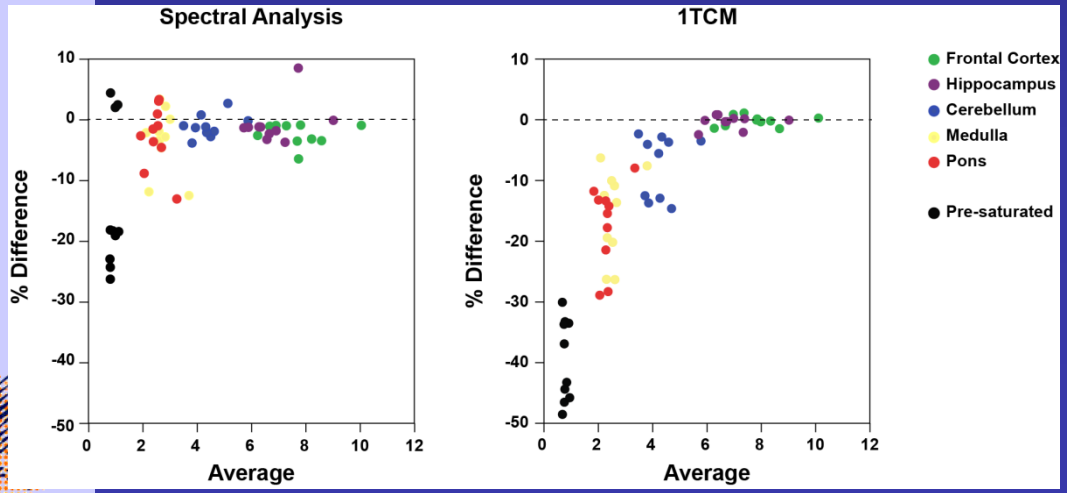


Simplify mathematical model -> shortened protocol

For [11C]raclopride studies (JCBFM, 2016)

Similar for [18F]FDOPA studies (submitted to JCBFM)

2) Exploring tracer kinetics and proposing optimized quantification



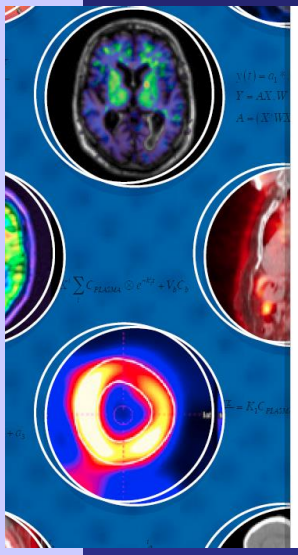
Test different models ->

define best quantification method

For [11C]flumazenil in rats

Progress of the project since January 2015

	Data acquisition	Quality Control	Method Development	Quantification Analysis	Manuscript
Chapter 1 (Introduction)	20%	N/A	N/A	N/A	-
Chapter 2 Reference tissue dual time point method for irreversible tracer kinetics quantification: validation for [18F]-FDOPA brain PET imaging	100%	100%	100%	100%	100%
Chapter 3 Dual time point imaging for post-dose binding potential estimation applied to a [11C]raclopride PET dose occupancy study	100%	100%	100%	100%	100%
Chapter 5 Automatic detection of neuroinflammation in pre-clinical PET imaging with [11C]PBR28	100%	100%	100%	100%	40%
Chapter 6 [11C]flumazenil kinetics in the rat brain	100%	100%	100%	100%	30%
Chapter 7 Parametric quantification of pre-clinical flumazenil data	100%	100%	100%	60%	20%



umcg

Tentative programme

INTERNATIONAL SYMPOSIUM

Quantification in Medical and Preclinical Imaging: state of the art and future developments

Registration: daily 8:30-17:00

Date: 20, 21 and 22 September 2016

Thank you !

University of Groningen
Abel Tasman Talent Program

- **Research vouchers**: support for 1 month stay of prospective Master & PhD students (orientation)
- **Summer school ticket**: covers registration fee
- **Research Master's scholarship**: tuition fee + €800 allowance per month for 2 years
- **PhD sandwich scholarship**: 2 year PhD in Groningen + 2 year at home institute; scholarship for 2 year in Groningen (covers tuition, benchfee, insurance, living expenses)
- **Staff ticket**: to set up cooperation; covers cost of stay

University of Groningen
Abel Tasman Talent Program

For information:

- Google: “abel tasman rug”
- Website university: www.rug.nl
- Website university medical center: www.umcg.nl
- Contact Groningen: Erik de Vries
- email: e.f.j.de.vries@umcg.nl