



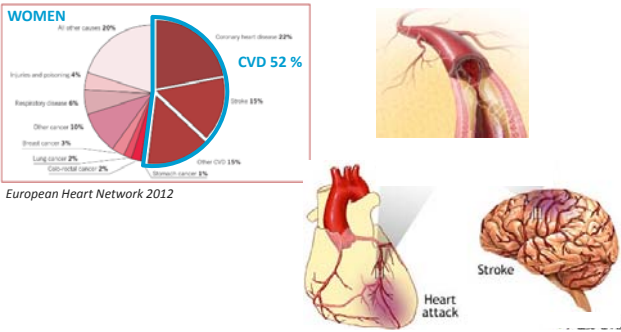
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Molecular Imaging in Preclinical Cardiovascular Research

Sven Hermann
European Institute for Molecular Imaging, Münster



Cardiovascular Disease – A Challenge Worldwide

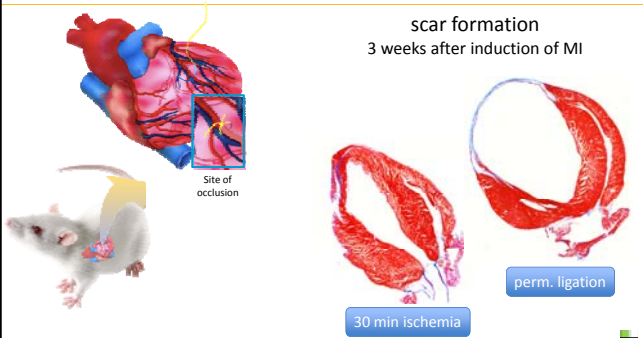


Cardiovascular Disease Models

Small animals do typically **not present** with cardiovascular diseases

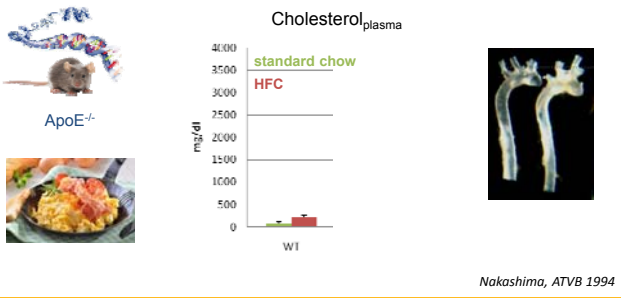


Induction of Myocardial Infarction



Animal Models of Atherosclerosis

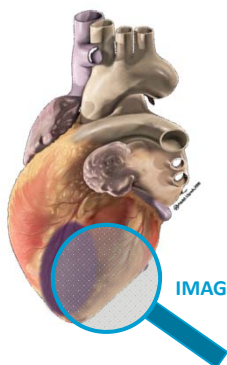
ApolipoproteinE^{-/-} mouse



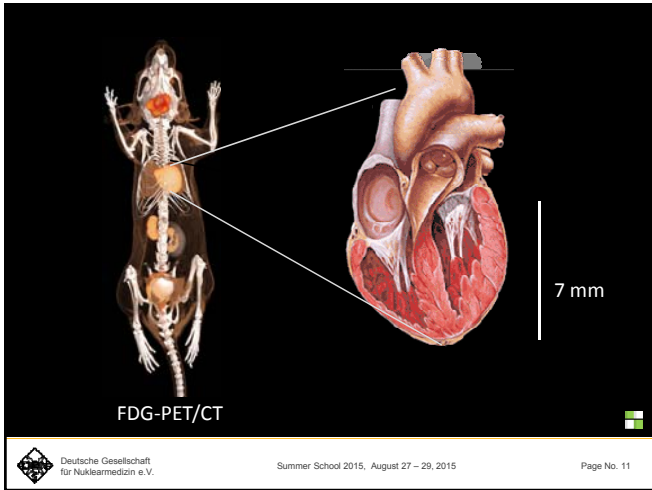
Nakashima, ATVB 1994

Nerves
Arrhythmia
Tachycardia
Bradycardia

Myocardium
Myocardial infarction
Cardiomyopathy
Heart failure



Vessels
Atherosclerosis
Coronary artery disease
Vasculitis



Prerequisites Monitoring of bio signals

eye ointment

cover

i.v. line resp probe anesthesia

temp probe ECG

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Prerequisites Movement Correction

Mouse: 26 g, heart rate, ~ 500 bpm

Reconstructed Gates: 8

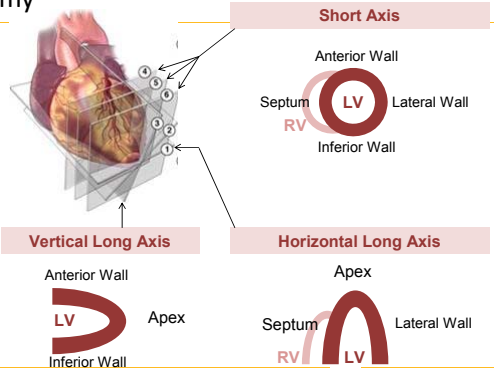
cardiac resp.

List mode acquisition:
60-90 min p.i. 12 MBq F-18-FDG

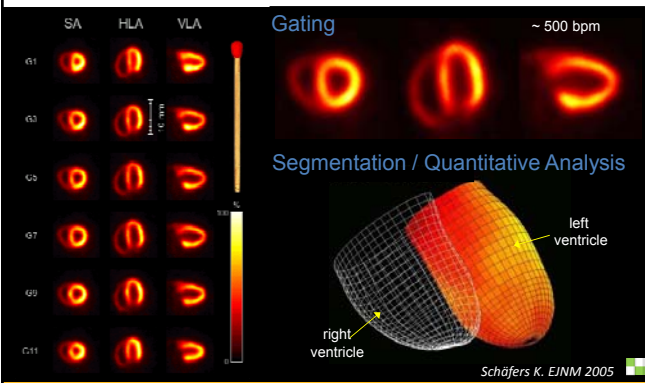
Schäfers K, Z Med Phys 2006

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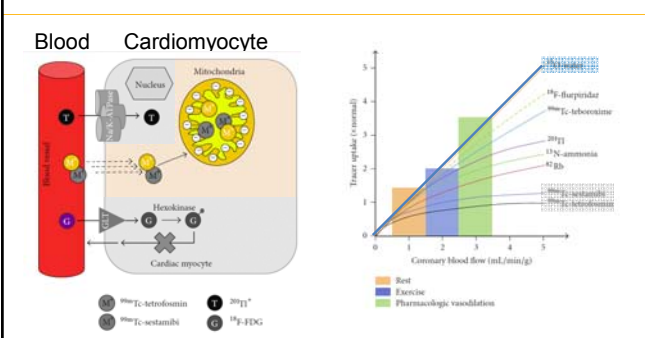
Prerequisites Anatomy



Healthy Mouse (26 g) – FDG-PET



Myocardial Perfusion Imaging

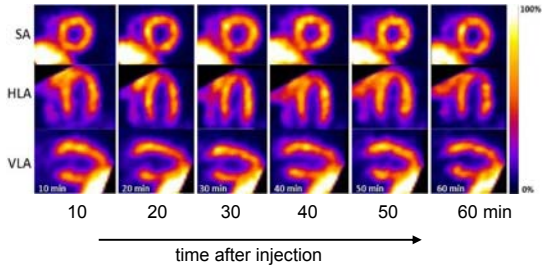


Sogbein, Biomed Res Int. 2014

Perfusion

SPECT: Tc-99m-Tetrofosmin

Healthy mouse, 26g



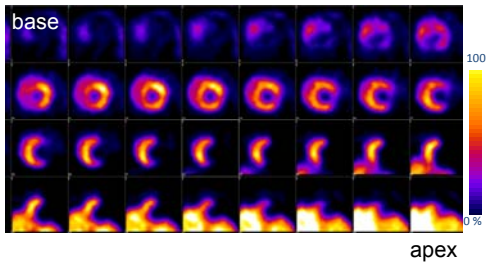
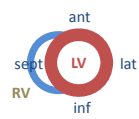
Vrachimis A, EJNMMI Res. 2012

Perfusion

SPECT: Tc-99m-Tetrofosmin

Mouse, 24g

Ischemia !



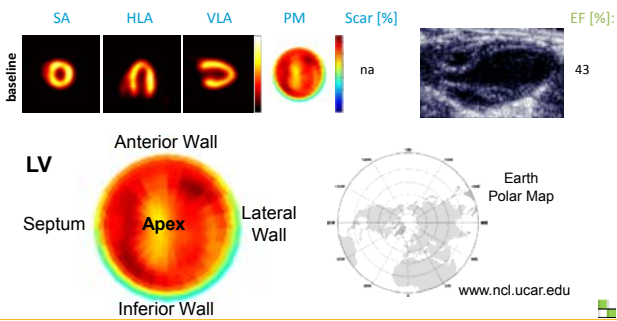
→ Viable Tissue ? / Scar? → FDG-PET

Viability & Function

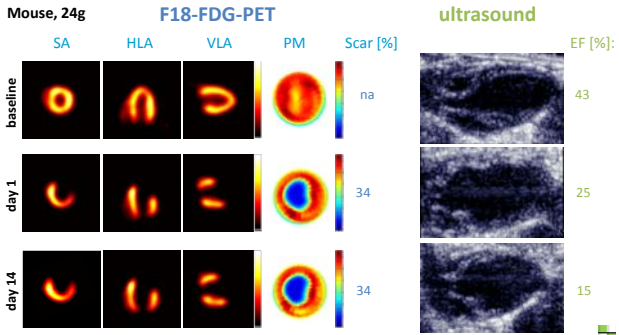
Mouse, 24g

F18-FDG-PET

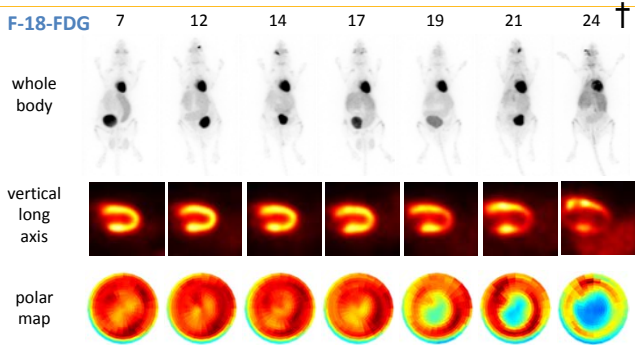
ultrasound



Viability & Function

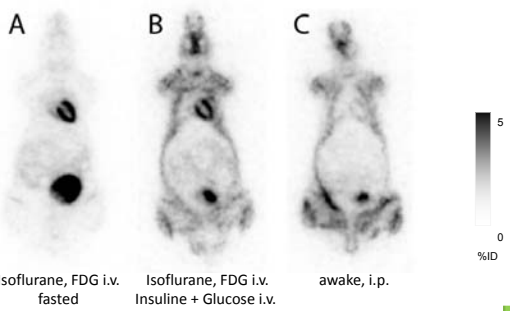


Longitudinal study

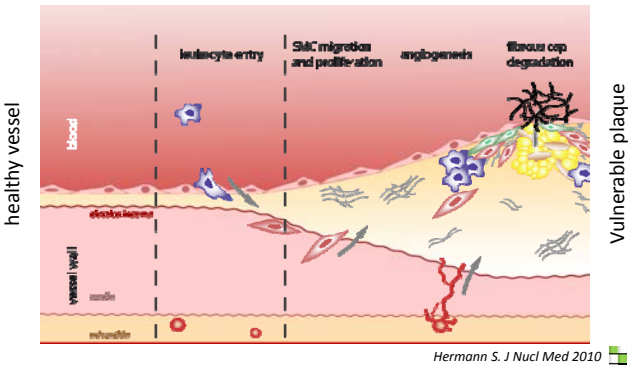


Prerequisites

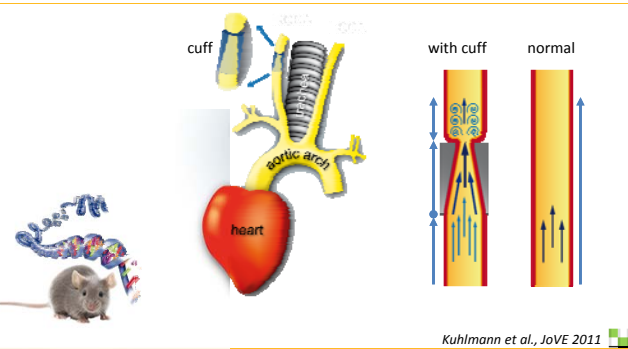
Animal Handling / Preparation – ¹⁸F-FDG 1 h p.i.



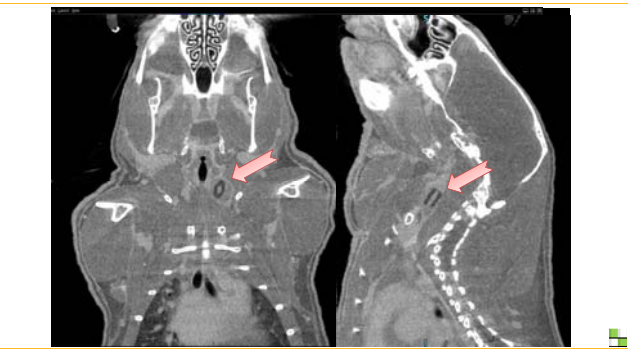
Atherosclerosis



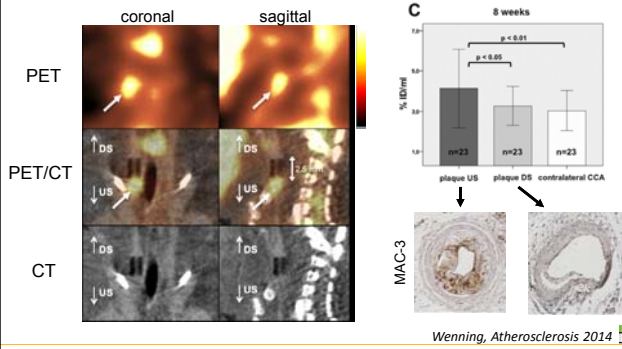
Cuff Model – Local Induction of Atherosclerosis



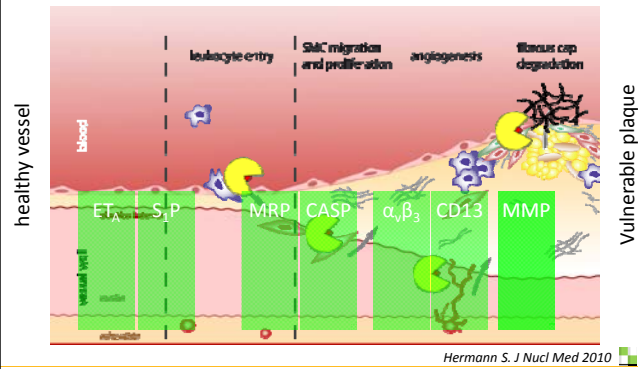
FDG-PET/CT in Carotid Cuff Model



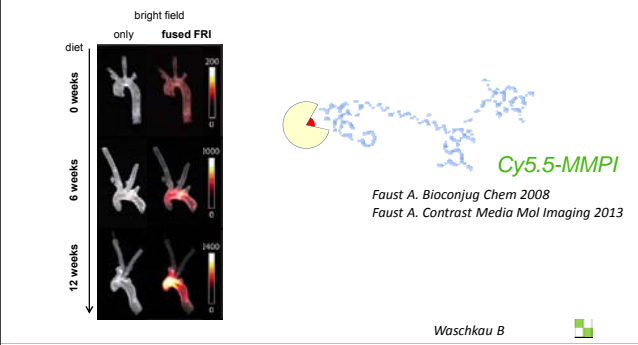
FDG-PET/CT in Carotid Cuff Model



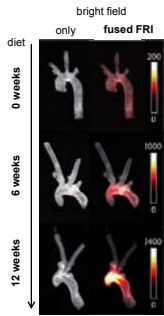
Atherosclerosis



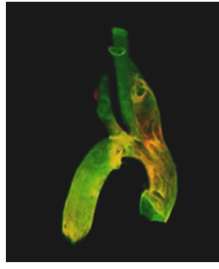
MMP Imaging in Models of Atherosclerosis Fluorescence labeled Tracer



MMP Imaging in Models of Atherosclerosis Fluorescence labeled Tracer



Ultramicroscopy



Wäschkau B & Kiefer F &

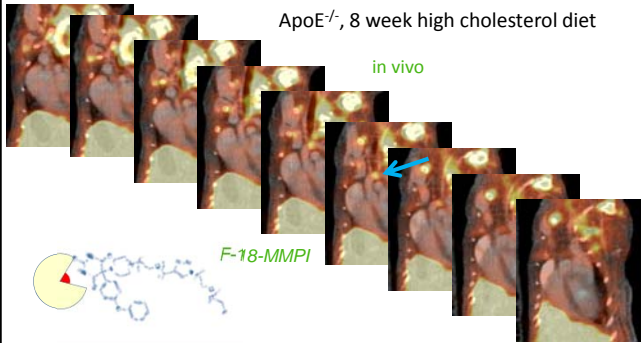


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MMP Imaging in Models of Atherosclerosis PET-Tracer (F-18)

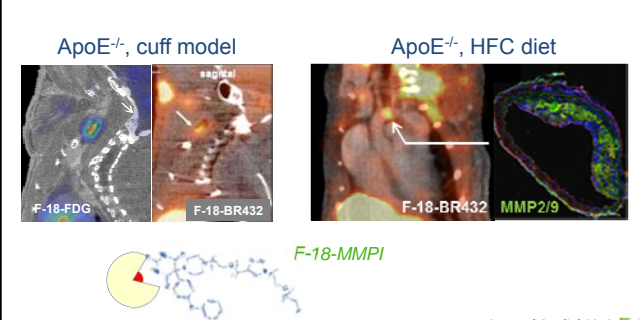


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MMP Imaging in Models of Atherosclerosis PET-Tracer (F-18)



Hermann S, J Nucl Cardiol 2012



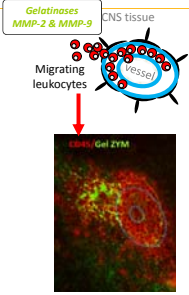
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Translational Imaging in MS

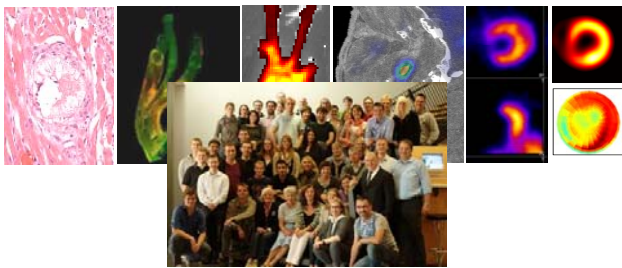
42 year old MS patient with acute phase



1 week after anti-inflammatory therapy

MMP-PET fused with Gd-enhanced T1-MRI
30-45 min p.i. of 250 MBq MMP radiotracer ¹⁸F-BR351

Hermann S, Sorokin L, Wiendl H, Schober O, Schäfers M



Mouse Imaging Workshop 9-13 November 2015

Topics

- **Animal handling:** i.v./i.p. injection, tail vein catheter, anaesthesia, surgery
- **μPET/μSPECT:** static and dynamic scanning, CT fusion
- **μCT:** in vivo scans +/- contrast agents, respiratory gating
- **μMRI:** in vivo scans +/- contrast agents, cardiac & respiratory gating
- **Ultrasound:** hands-on scanning +/- contrast agents
- **Optical imaging:** fluorescence, bioluminescence
- **Multimodal imaging:** PET/CT, PET/MRI, SPECT/CT
- **Image analysis:** methods, coregistration, quantification (VisualLab)



<http://www.uni-muenster.de/EIMI/teaching/mia/>
