A totally non-invasive setup for the investigation of skeletal muscle vasodilatory reserve in animal models (J. Menard's thesis)

Proposal

New approach using ^{1}H-NMR functional imaging in rodents:

Quantification of skeletal muscle perfusion using NMRI-Arterial Spin Labeling techniques

+

Determination of diastolic and systolic blood pressures using NMR angiography

Assessment of microvascular function in skeletal muscle of mice or rats using functional NMR imaging:

- -Non-invasively
- -*In vivo*
- -Locally
- -Quantitavely
- -Serially
- -Dynamically

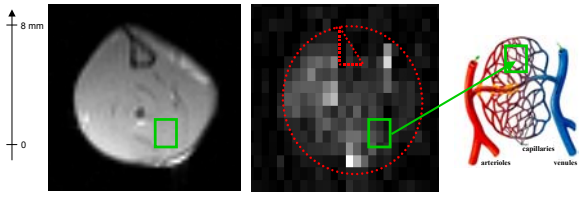
1- Quantification of skeletal muscle perfusion with functional NMRI: principle

NMRI-Arterial Spin Labeling (ASL) sequence to quantify tissue perfusion:

Perfusion: *amount of blood flowing into tissue per volume and time units (ml.min^{-1}.100g^{-1})*

FAST NMR IMAGING + ASL MODULE with NMR (SATIR^{2})

(magnetically labeled blood water is used as endogenous tracer of the tissue perfusion)



Anatomical image of a mouse leg transverse section

Corresponding perfusion map

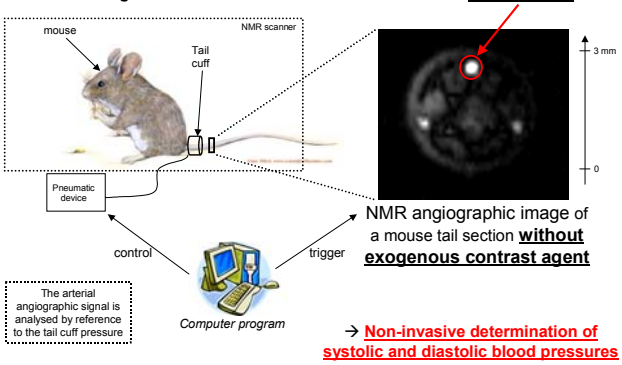
+Non-invasive +Local (195x195um^{2}) +Quantitative +Dynamic (9s)

2-Raynaud J.S. et al, MRM, 2001

2- Determination of Arterial BP with NMR angiography: principle

Based on sphygmomanometric technique[1]:

Tail cuffing combined with detection of blood inflow in caudal artery.

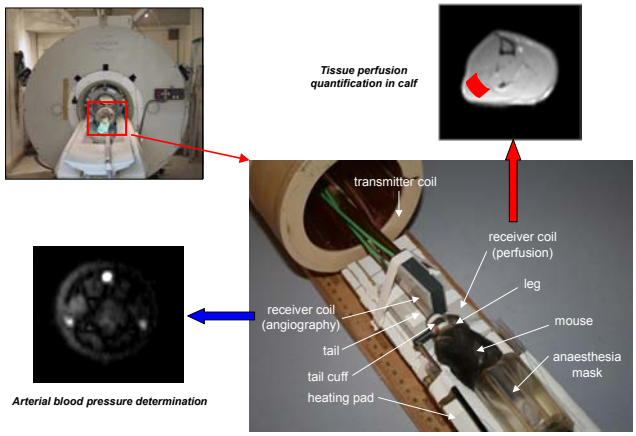


NMR angiographic image of a mouse tail section **without exogenous contrast agent**

→ **Non-invasive determination of systolic and diastolic blood pressures**

1-Williams J.R. et al, J Clin Invest, 1939

3- Interleaved determinations of tissue perfusion and systemic BP with functional NMRI: principle



Arterial blood pressure determination

4- assessment of peripheral vascular resistances using functional NMRI: application

Diabetes mellitus Type-2 db/db mouse model ***(preliminary results)*****:**

	perfusion peak following 30min of ischemia (ml.min^{-1}.100g^{-1})	Diastolic BP (mmHg)	Systolic BP (mmHg)	Mean BP (mmHg)	vascular conductance peak (ml.min^{-1}.100g^{-1}.mmHg^{-1})
db/db (n=17)	82 ± 19	63 ± 9	77 ± 9	68 ± 9	1,22 ± 0,3
control (n=14)	105 ± 38	85 ± 15	104 ± 16	91 ± 15	1,27 ± 0,7
statistics analysis (student Test)	p< 0,05	p< 0,05	p< 0,05	p< 0,05	NS