BIOMEDIA
La condivisione del sapere

Per quanto concerne i moderatori, relatori, formatori, tutor, docenti è richiesta dall'Accordo Stato-Regioni vigente apposita dichiarazione esplicita dell'interessato, di trasparenza delle fonti di finanziamento e dei rapporti con soggetti portatori di interessi commerciali relativi agli ultimi due anni dalla data dell'evento.
La documentazione deve essere disponibile presso il Provider e conservata per almeno 5 anni.

Dichiarazione sul Conflitto di Interessi

Il sottoscritto_____Micotti Edoardo_____ in qualità di:

□ responsabile scientifico □ moderatore □ docente X relatore □ tutor

dell'evento "X CONGRESSO AIRMM - RISONANZA MAGNETICA IN MEDICINA 2019:
DALLA RICERCA TECNOLOGICA AVANZATA ALLA PRATICA CLINICA"
Milano, 28-29 marzo 2019

da tenersi per conto di **Biomedia srl Provider n. 148,**

ai sensi dell'Accordo Stato-Regione in materia di formazione continua nel settore "Salute" (Formazione ECM) vigente,

Dichiara

X che negli ultimi due anni NON ha avuto rapporti anche di finanziamento con soggetti portatori di interessi commerciali in campo sanitario

□ che negli ultimi due anni ha avuto rapporti anche di finanziamento con soggetti portatori di interessi commerciali in campo sanitario (indicare quali):

_____ _____
_____ _____
_____ _____
_____ _____

Italian IRCCS Network for Advanced Neuroimaging Research. Optimization and harmonization of quantitative MRI preclinical protocols

Edoardo Micotti
Laboratory of Biology of Neurodegenerative Disorders
MRI facility, Department of Neuroscience

MRI sequences:

Diffusion Tensor Imaging: EPI-DTI

Morphology: RARE Spin Echo T2w 3D

72mm whole body coil + head shaped quadrature surface coil

Site	Field Strenght	Gradient System	Imax (A)	Vmax (V)	SNR/mm^3 (Specified = 5300)
Mario Negri (MNI)	7T (Biospec)	BGA12SL	200	300	7954
San Raffaele (OSR)	7T (Biospec)	BGA12S2	300	500	6733
Istituto Besta	7T (Biospec)	BGA12S HP	300	500	9369
Neuromed	7T (Pharmascan)	BGA9HP	100	150	7783
SDN	9.4 T	BGA12HPS1	200	300	18875

Maximum Image Ghost (<2.5%)	No other image artifacts visibile	Maximum homogeneous N/2 Ghost (<5%)	Maximum edge ghost (<10%)	Image Intensity reproducibility (<2%)
1.84	ok	0.95	4.5	0.64
0.73	ok	1.0	1.6	-
2.33	ok	1.1	2.65	0.55
1.22	ok	1.1	2.3	0.71
0.41	ok	1.6	1.65	0.7

(**Phase I**): Choice of sequence parameters. Testing on phantoms and WT mice

Transgenic mouse model **APP/PS1** for Alzheimer's disease

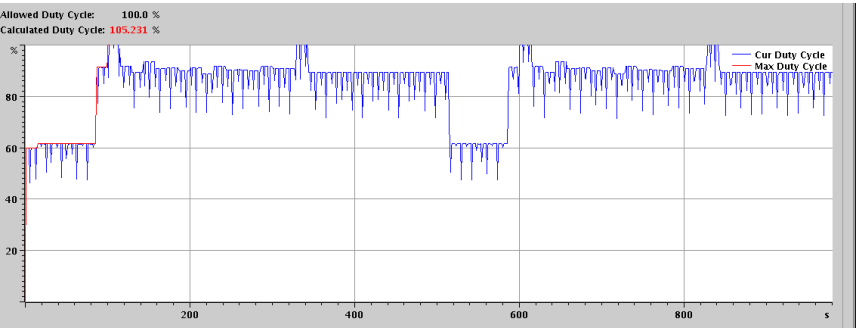
(**Phase II**) Longitudinal study at **4 months, 7/8 months** (moderate plaques load and no cognitive deficit), **11/12 months** (high plaques load and severe cognitive deficit)
(**Phase III**) Last longitudinal time point at **18 months** (natural life span around 24 months) and functional/metabolic sequence harmonization.

Male vs female to investigate gender effects
WT vs TG to investigate site dependent inhomogeneities

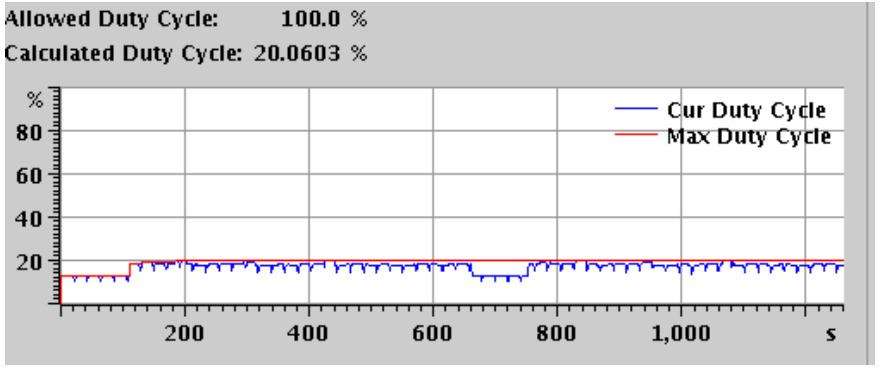
Shared protocols:

	Structural Image	DTI	DTI (published papers)
Method	RARE	EPI	SE - EPI
Repetition Time (ms)	2500	3500	
Echo Time (ms)	60	27	
NSegments	-	2	1-4
NRepetitions	1	2	
Matrix	300 x 100 x 120	128 x 96	
NSlices	-	14	
Field Of View	30 x 10 x 12	14.8 x 11	
In Plane Resolution (mm)	0.1 x 0.1 x 0.1	0.115 x 0.115	0.08 – 0.2
Slice Thickness (mm)	-	0.66	0.125 - 1.0
Diff. Dir	-	30	6 - 64

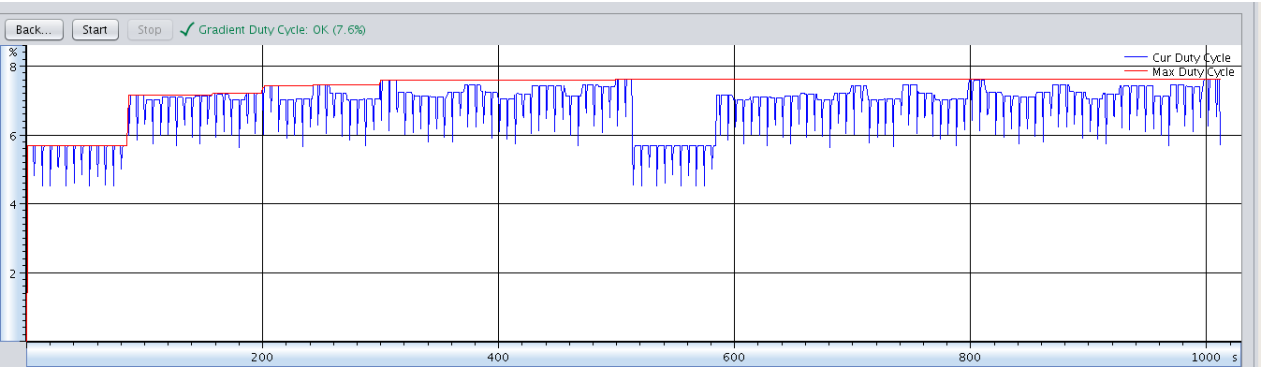
Hardware limitations: EPI-DTI



Site1: 105%



Site2: 20%



Site3 : 8%

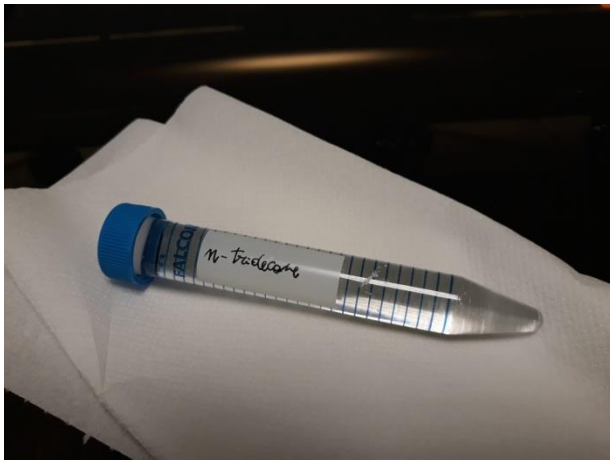
Test on Phantoms

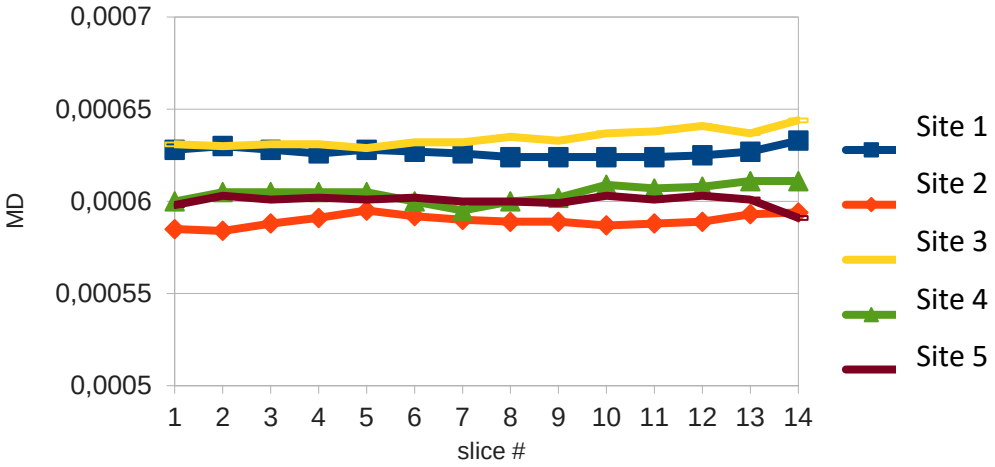
Magnetic Resonance in Medicine 43:368–374 (2000)

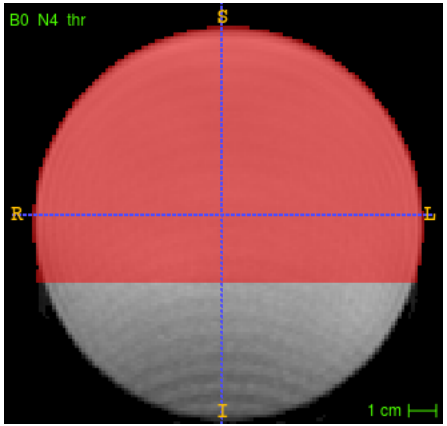
Test Liquids for Quantitative MRI Measurements of Self-Diffusion Coefficient In Vivo

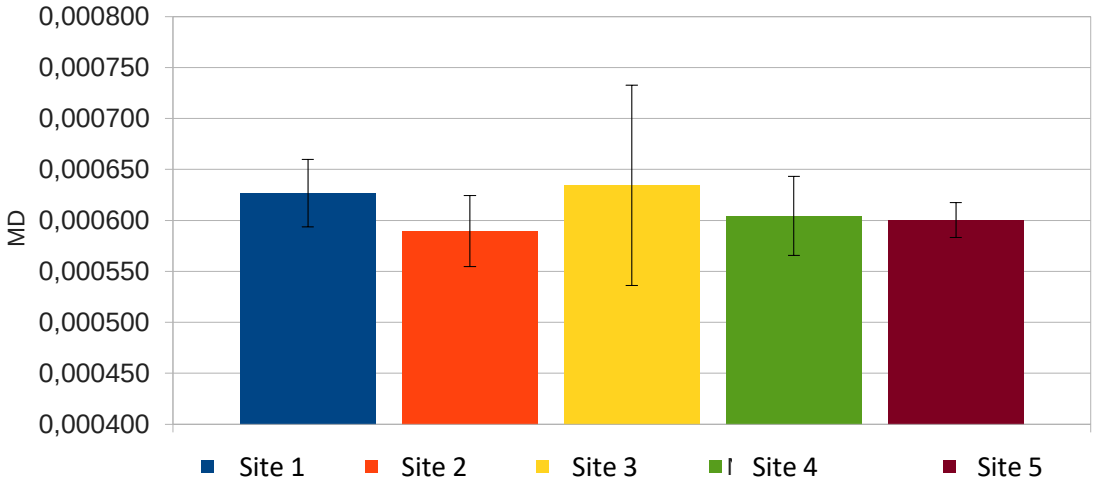
P.S. Tofts,[1]* D. Lloyd,[2] C.A. Clark,[1] G.J. Barker,[1] G.J.M. Parker,[1] P. McConville,[2] C. Baldock,[2] and J.M. Pope[2]

Phantom to test Diffusion protocol → n-tridecane apparent diffusion Coefficient (ADC) close to the ADC of healthy White Matter



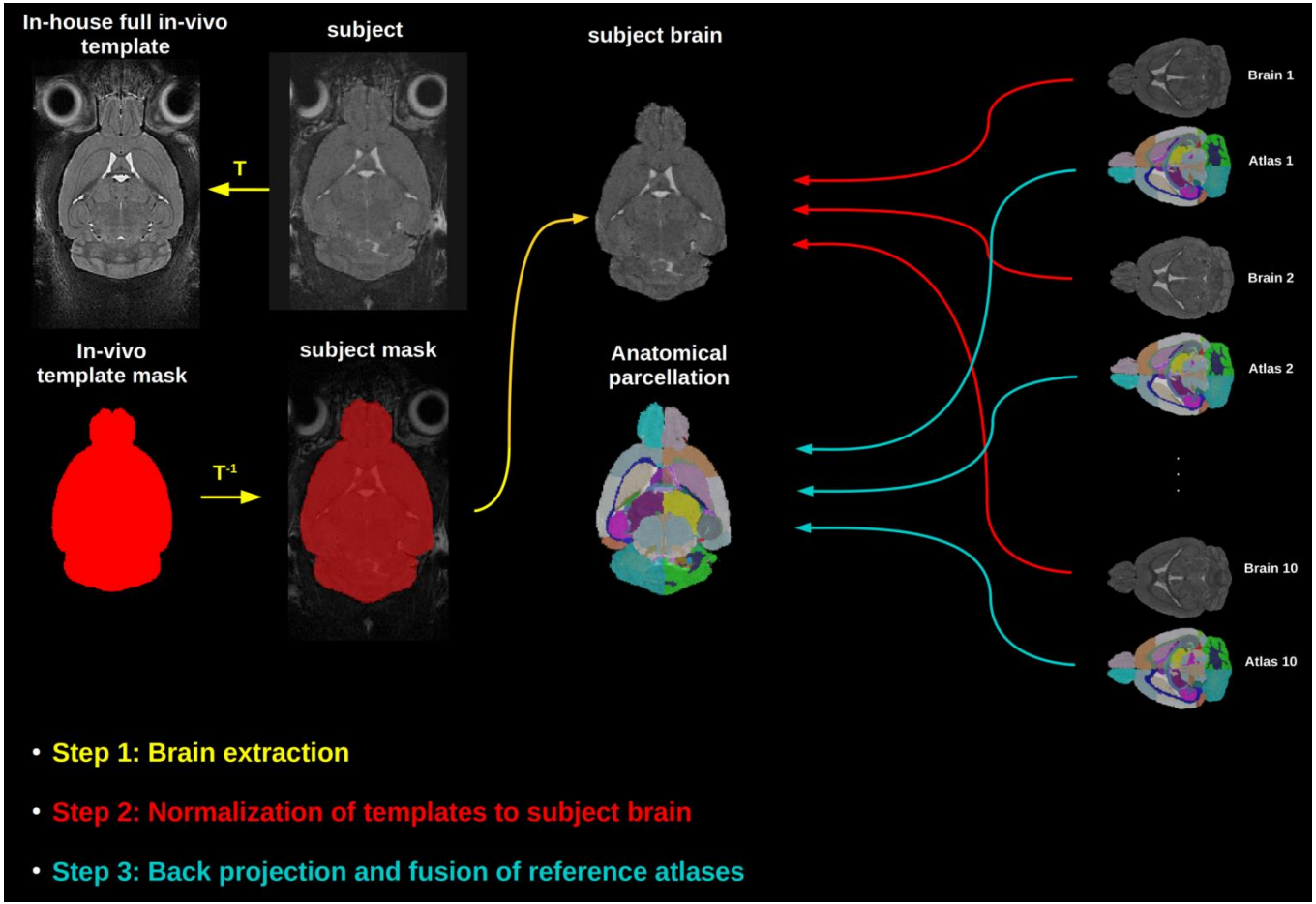


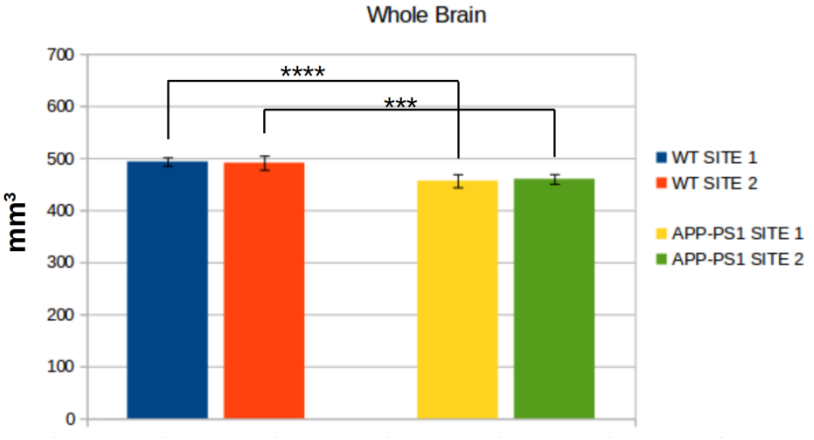


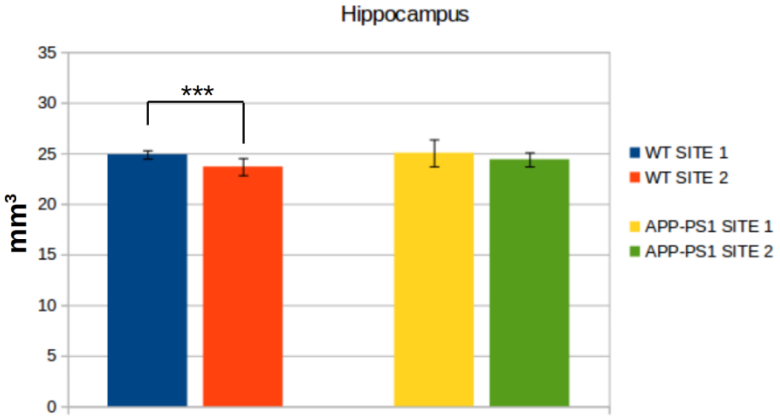


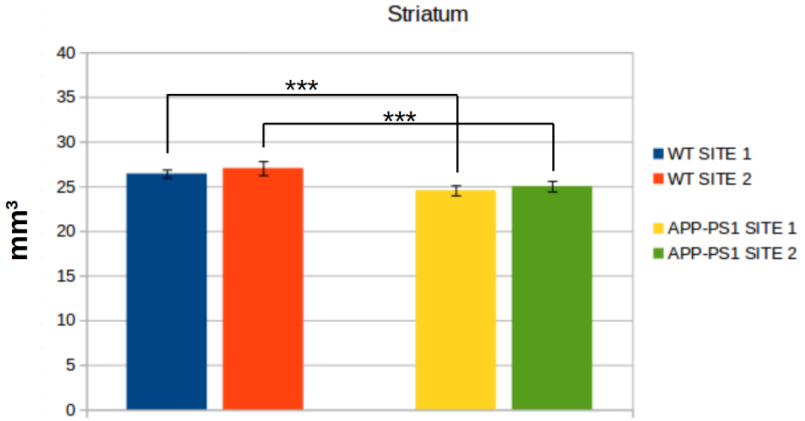
Maximum deviation of 7% from Tridecane ADC value at 20°C ($0.635\ 10^{-3}$ mm^2/s)

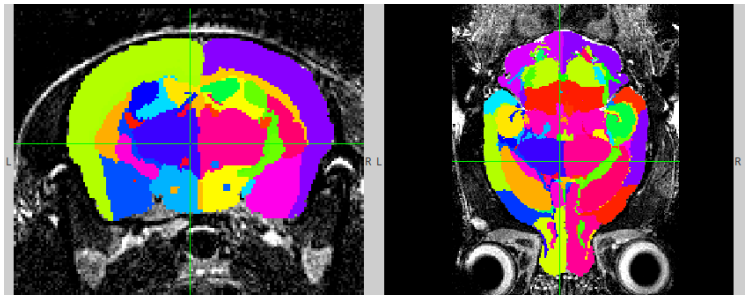
Structural Parcellation





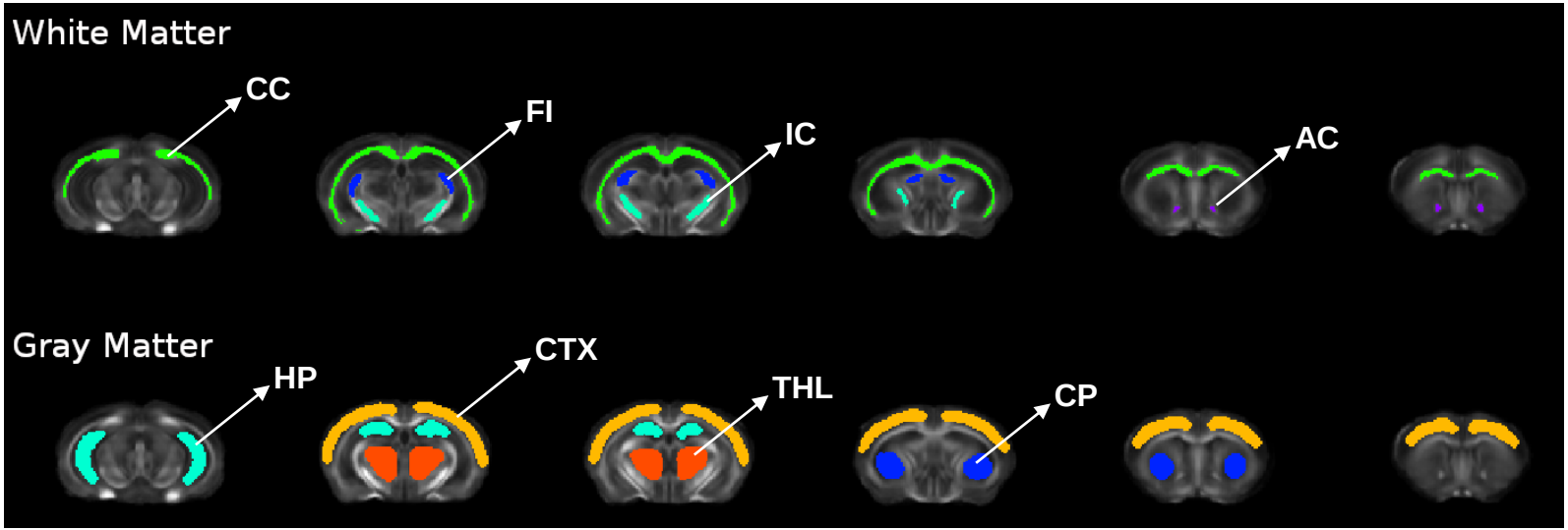






4 months old mice

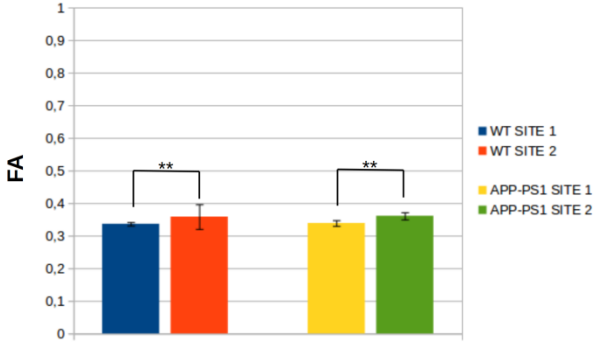
WM - Tract of interests

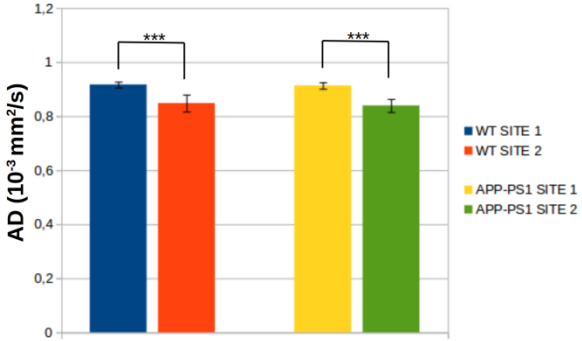


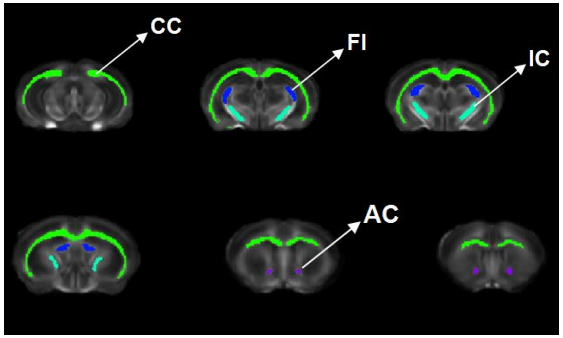
Corpus Callousum (CC), Fimbria (FI), Internal Capsule (IC), Anterir Commisure (AC), Hippocampus (HP), Cortex (CTX), Thalamus (THL), Caudate Putamen (CP)

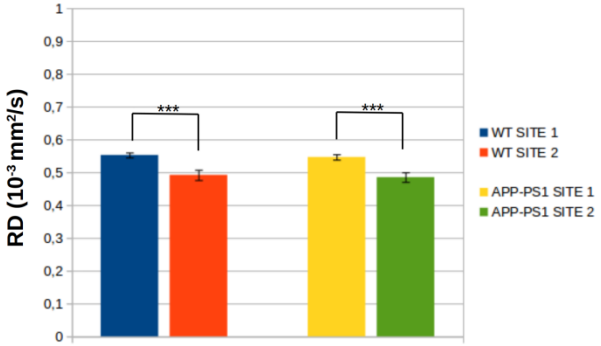
- Automatic brain extraction.
- Tensor estimation.
-Template construction (with DTITK software) and definition of region of interests.
- Normalization of all subject to the study specific template.
- Extraction of the mean value whitin each ROI of the FA, AD, RD and MD values.
- Statistical comparison (Two-way ANOVA)

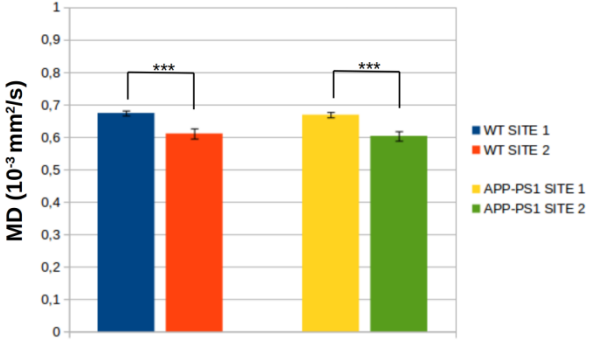
Corpus Callosum

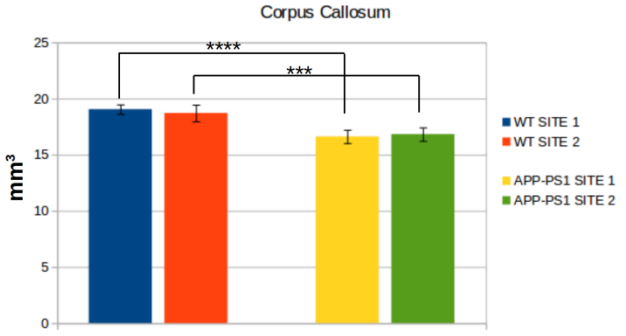






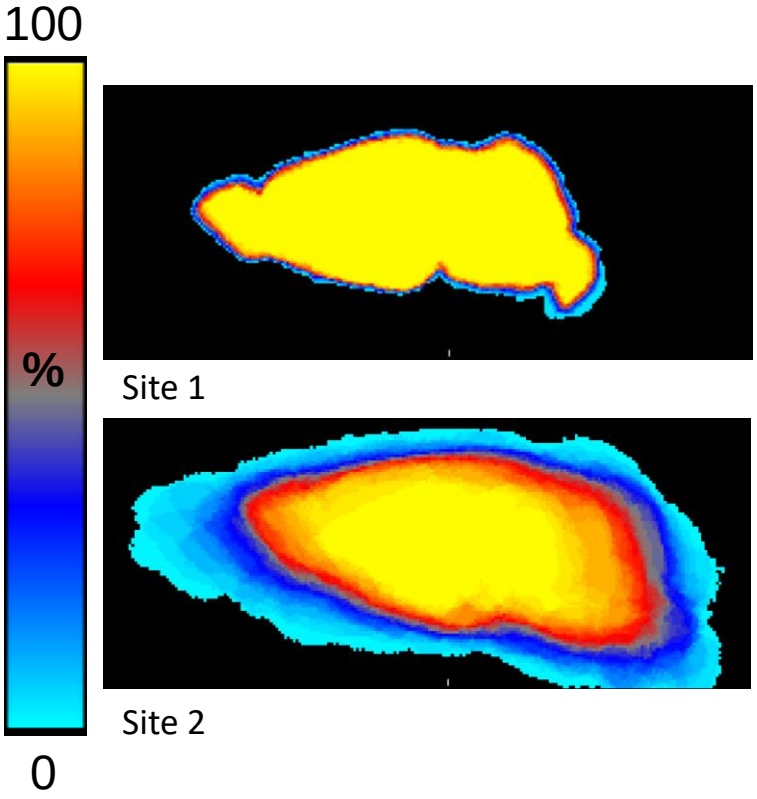


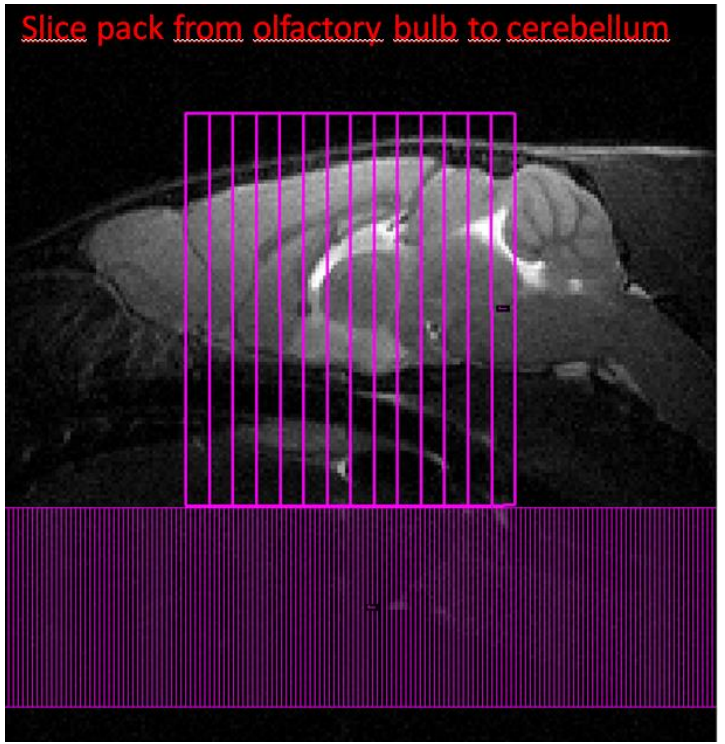




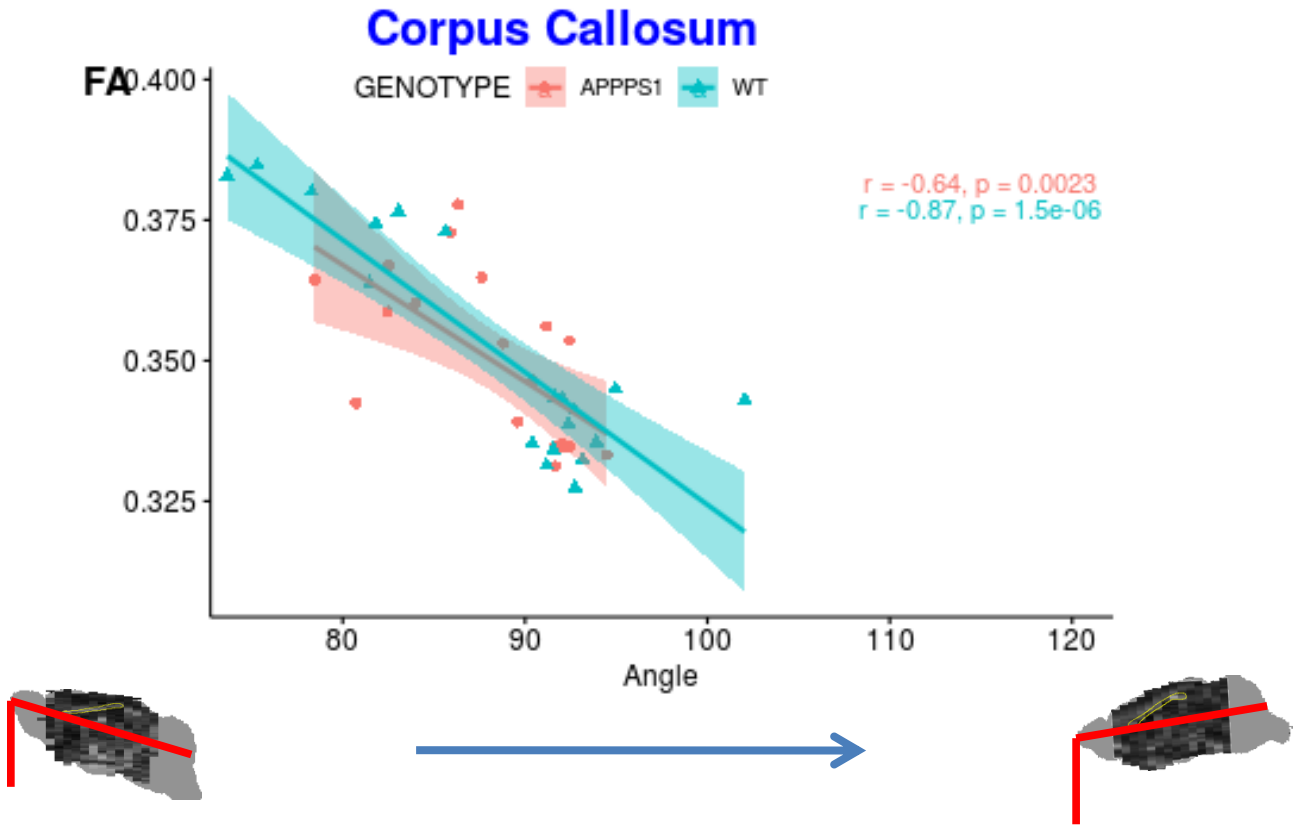
- Different absolute values
- Different data dispersion

Effect of head positioning





DTI slice package


Corpus Callosum
FA
0.400
0.375
0.350
0.325
GENOTYPE
APPPS1
WT
r = -0.64, p = 0.0023
r = -0.87, p = 1.5e-06
80
90
100
110
120
Angle

Conclusions

- First attempt to harmonize preclinical MRI sequences between Italian research centers.
- Hardware performances highly affect the choice of common parameters.
- Preliminary results show a good accordance in structural data between centers.
- Animal positioning could represent an important issue for DTI results.

Thank you for your attention