METABOLIC BIOMARKERS IN PATIENTS WITH MCI and PD

Petra Tomše

Department of Nuclear Medicine
University Medical Centre Ljubljana

We studied

- Metabolic brain changes in patients with:
MCI, PD, PD-MCI

- Expression of specific metabolic brain networks for Alzheimer's disease (ADRP)
and Parkinson's disease (PDRP)

- Correlation of metabolic brain characteristics (ADRP) and CSF biomarkers for AD in individual subjects

Participants

	MCI	MCI a	MCI na
N	20	12	8
Age [yrs]	70 ± 8	68 ± 9	73 ± 5
MMSE	28 ± 2	28 ± 1	28 ± 2
MOCA	24 ± 3	22 ± 4	24 ± 3

	PD	PD-MCI	Controls
N	15	15	21
Age [yrs]	67 ± 6	71 ± 8	67 ± 7
Parkinson's disease duration [yrs]	3 ± 2	5 ± 3	
MMSE	29 ± 1	29 ± 1	29 ± 1
MOCA	28 ± 2	25 ± 3	27 ± 2

METABOLIC BRAIN CHANGES

Studied with brain FDG/PET
Analysed with Statistical Parametric Mapping (spm8),
at p=0.05 level

MCI

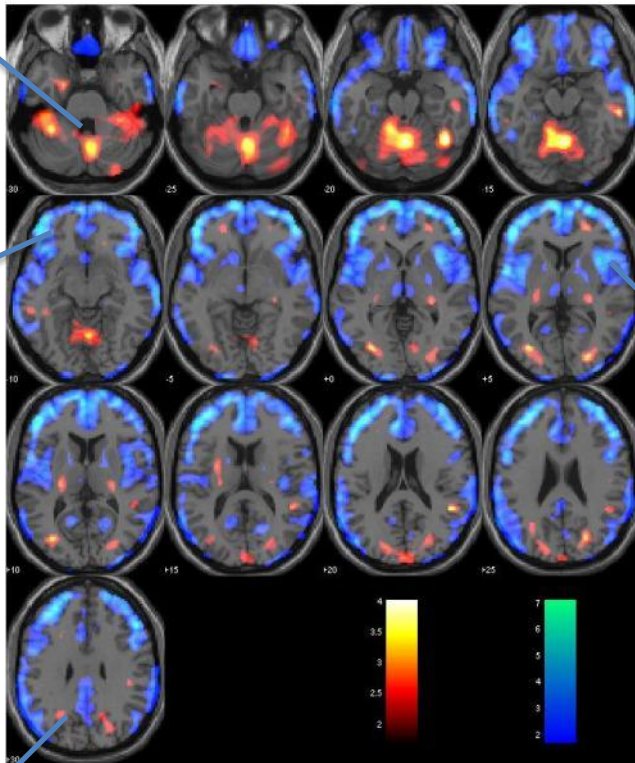Cerebellum

Frontal regions

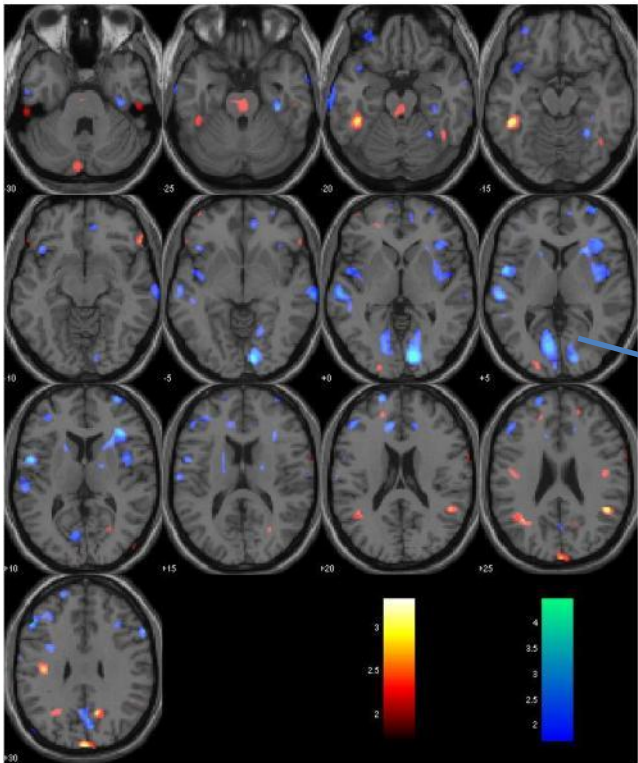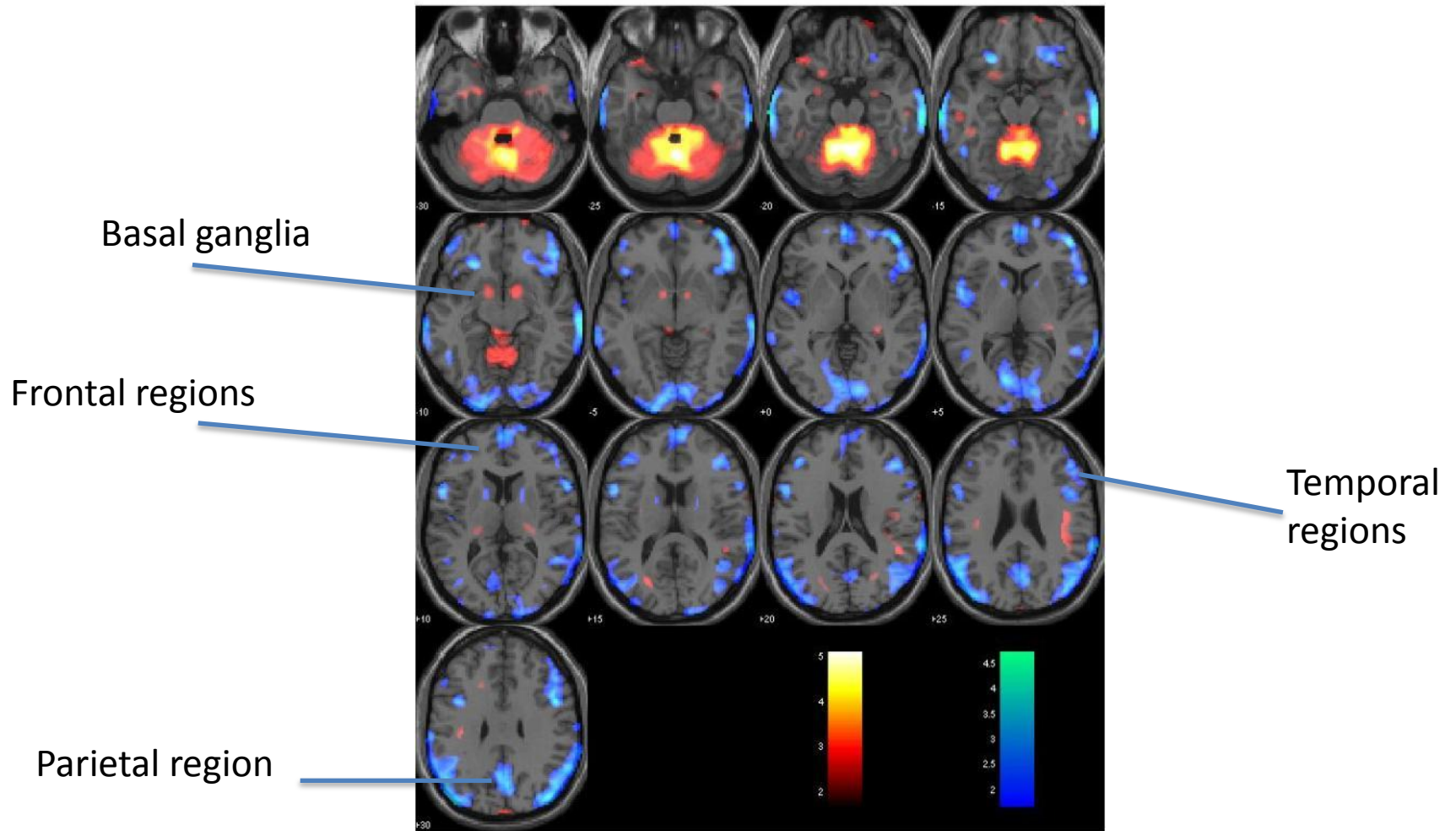Temporal regions
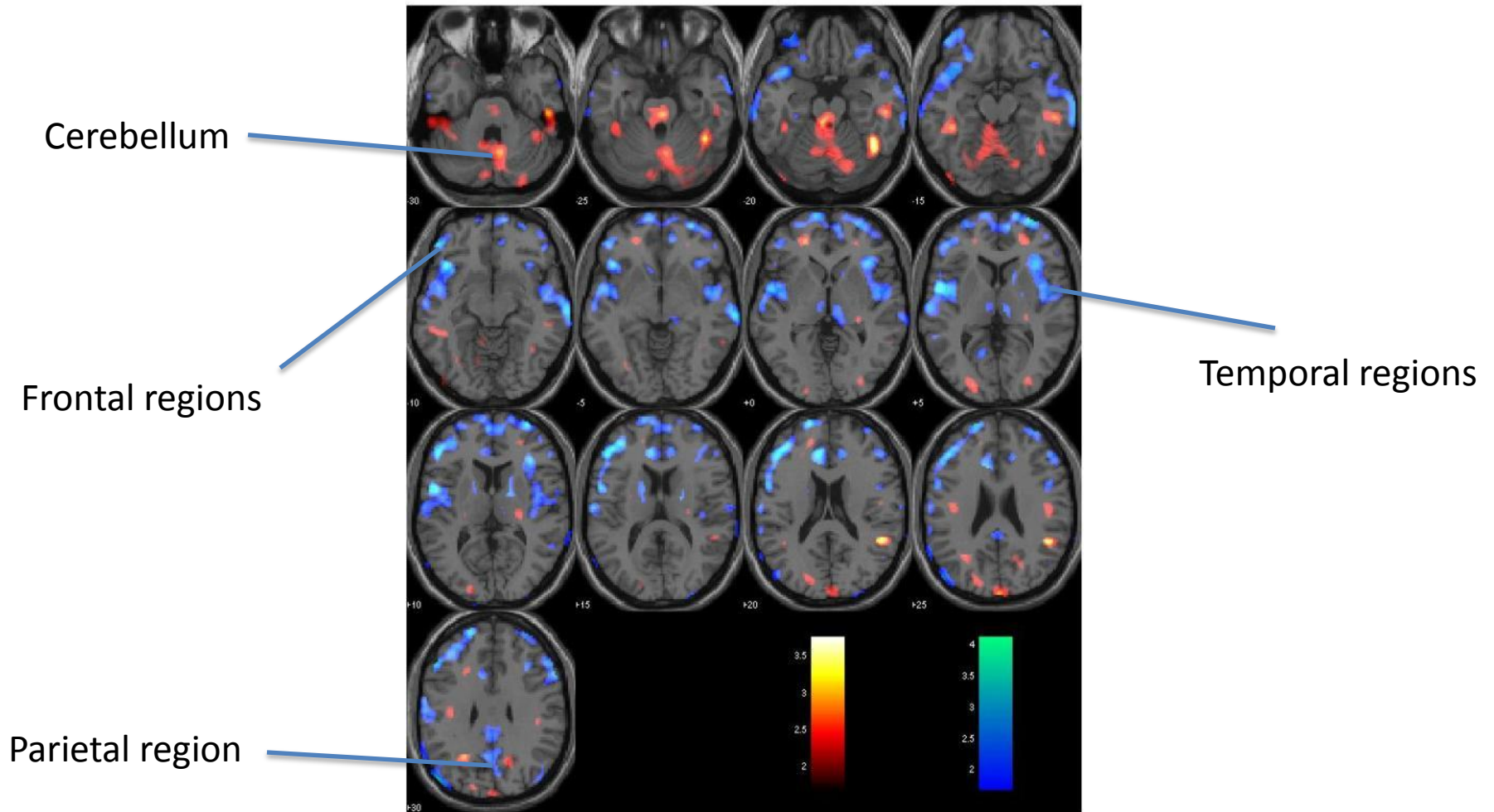
Parietal region

MCIna

MCIa

Cerebellum

Frontal regions

Temporal regions

Parietal region

Occipital region

PD

Basal ganglia

Frontal regions

Temporal regions
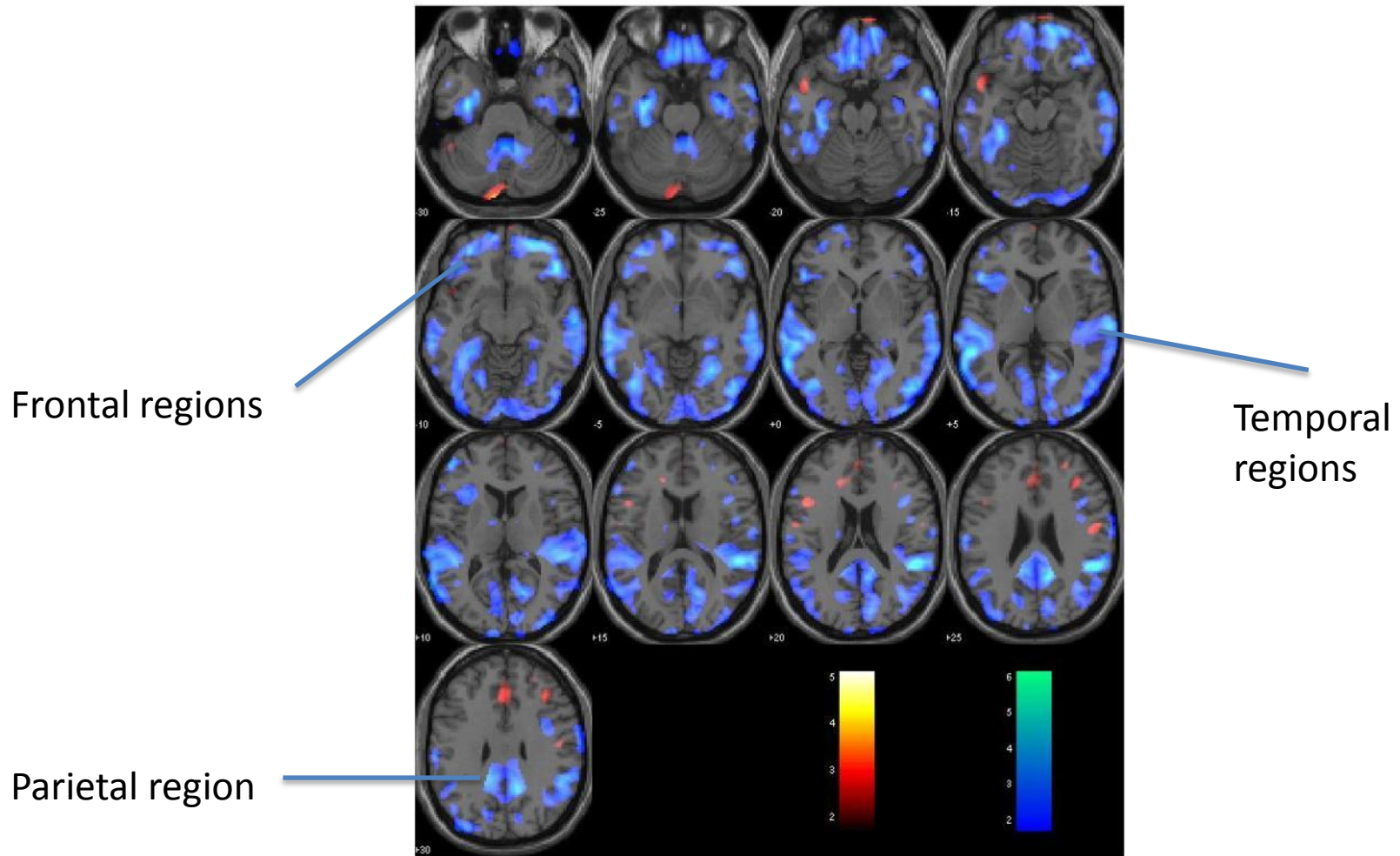
Parietal region

PD-MCI vs. PD


Frontal regions

Temporal regions

Parietal region

Conclusion – metabolic brain changes

- In MCI patients hypometabolism was pronounced in various cortical brain regions, more pronounced in MCIna compared to MCIa

- In PD-MCI (compared to PD) hypometabolic brain regions were identified in parietal, lateral temporal and in frontal brain cortex

METABOLIC NETWORK EXPRESSION
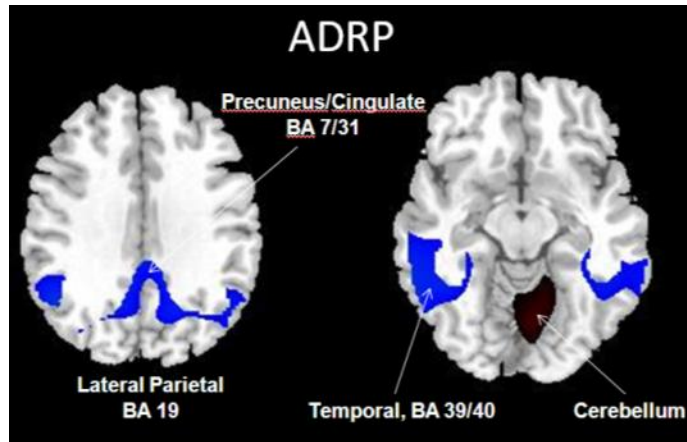

Nazem, Soc.for Neuroscience, 2014
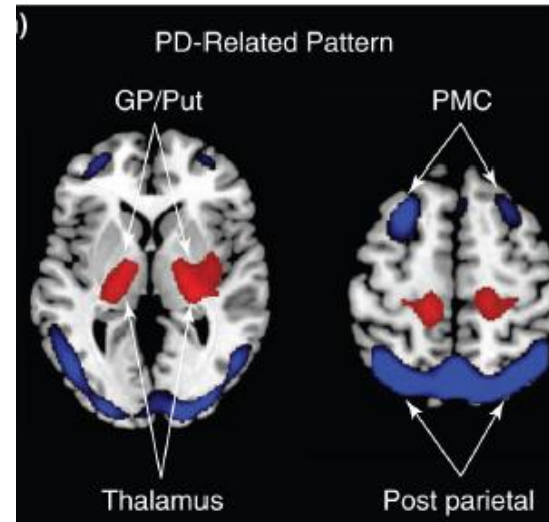
Eidelberg, Trends Neurosci. 2009

Alzheimer's **D**isease **R**elated **P**attern, **P**arkinson's **D**isease **R**elated **P**attern:
Charactetistic metabolic brain networks ,
identified using principal component analysis

Reveal functional connections between disease affected regions,
sensitive to early subtle changes
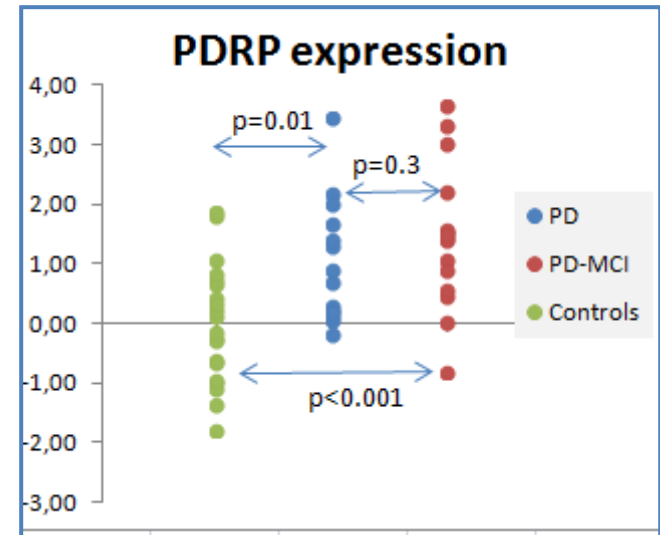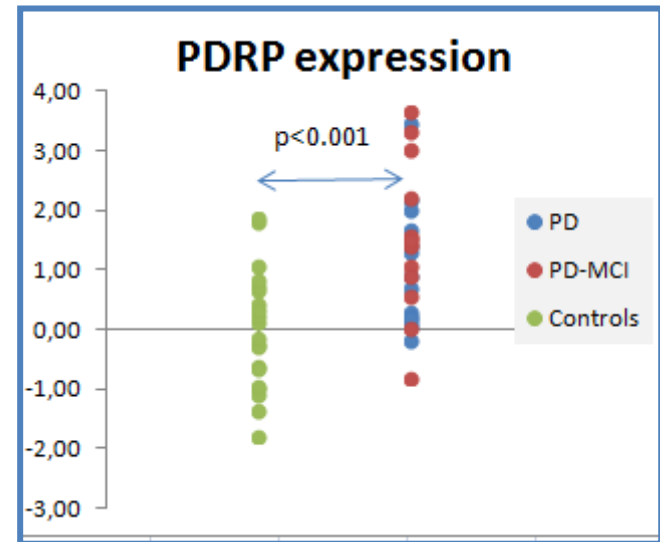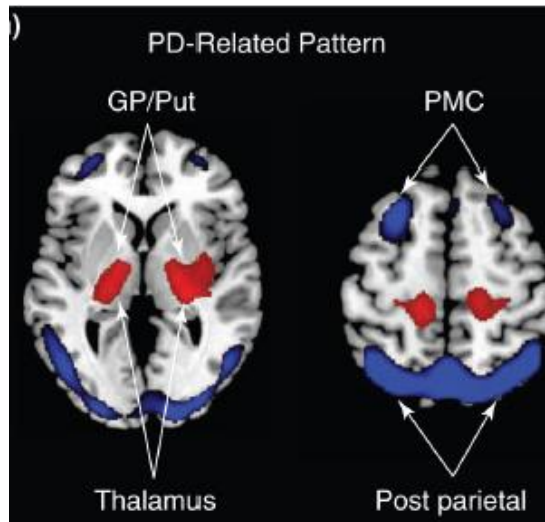
ADRP expression in MCI

Alzheimer's **D**isease **R**elated **P**attern
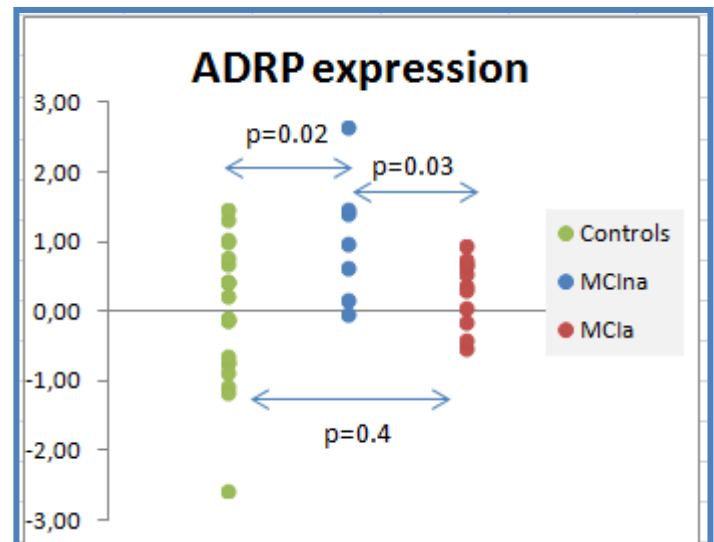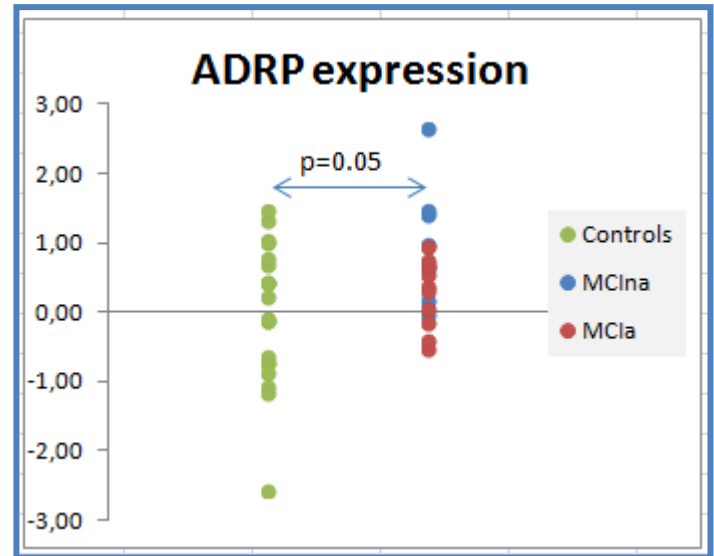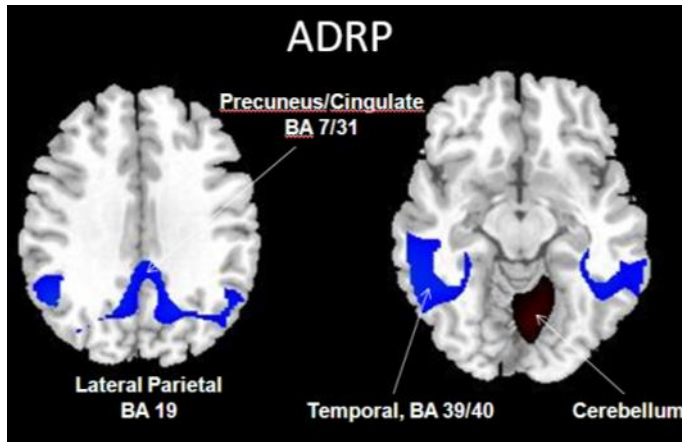
	all MCI	MCIa	MCIna
ADRP expression	0.6 ± 0.8	0.3 ± 0.5	1.1 ± 0.9
p-value (NC)	0.05	0.4	0.02

PDRP expression in PD

Parkinson's **D**isease **R**elated **P**attern

	all PD	PD	PD-MCI
PDRP expression	1.3 ± 1.1	1.0 ± 1.0	1.5 ± 1.2
p-value (NC)	<0.001	0.01	<0.001

Conclusion – metabolic networks expression

- Expressions of brain metabolic networks ADRP and PDRP allow differentiation between patients and controls

- ADRP and PDRP may be useful biomarkers of early AD and PD

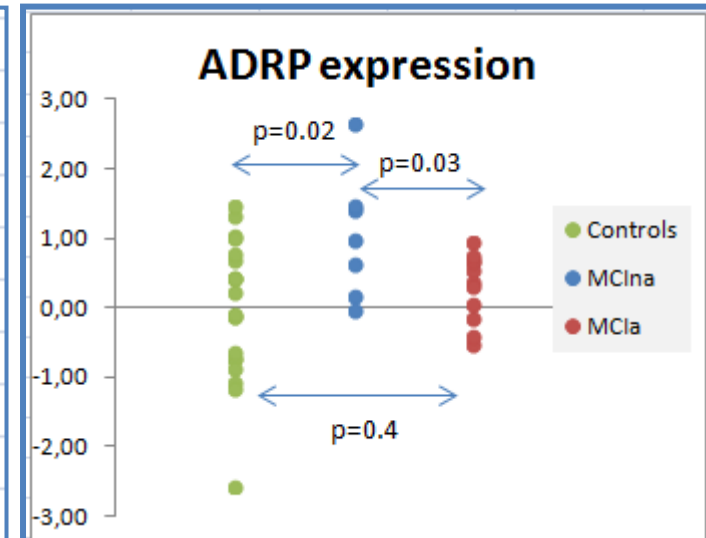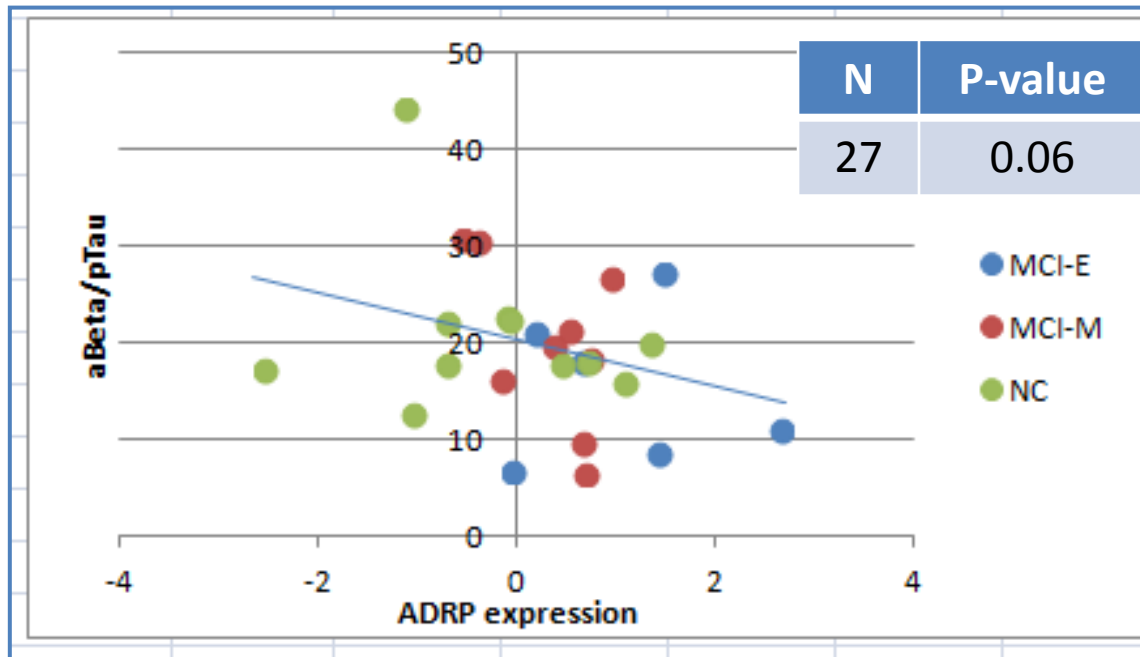# CORRELATION BETWEEN METABOLIC AND CSF BIOMARKERS
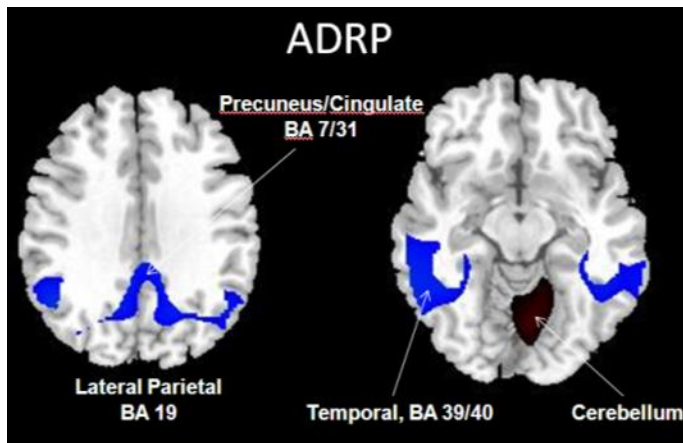
Alzheimer's **D**isease
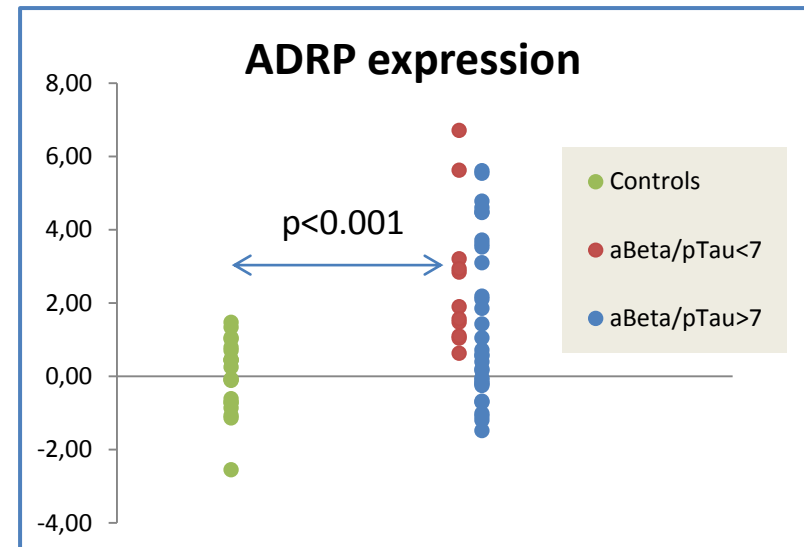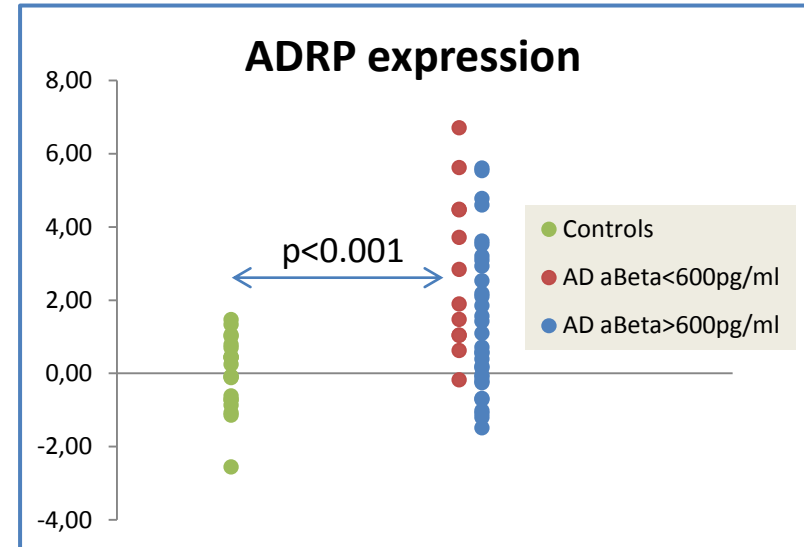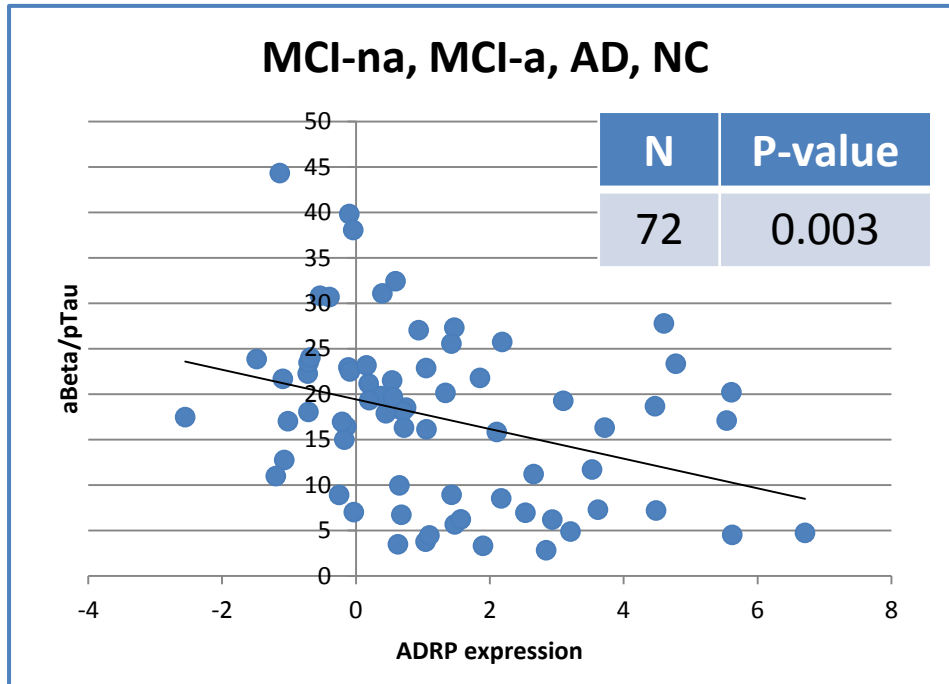**R**elated **P**attern

Low Amyloid Beta – amyloid accumulation
High Tau, pTau - neurodegeneration

ADRP expression correlation with CSF parameters

ADRP expression correlation with CSF parameters

MCI-na, MCI-a, AD, NC

N	P-value
72	0.003

AD subjects

N	Age	MMSE	MoCA
45	71± 9	24 ± 5	21 ± 4

ADRP expression

p<0.001

- Controls
- AD aBeta<600pg/ml
- AD aBeta>600pg/ml

ADRP expression

p<0.001

- Controls
- aBeta/pTau<7
- aBeta/pTau>7

Conclusion – ADRP and CSF

- The value of ADRP as a biomarker was confirmed with its correlation with CSF biomerkers for AD

Aknowledgments