Q Amyloid: an open-access platform for automated amyloid-beta quantification

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Text Amyloid-beta (Aβ) deposition is one of the earliest neuropathological hallmarks of Alzheimer's disease (AD), and Positron Emission Tomography (PET) is commonly used todetect Aβ in vivo. However, an automated PET-based pipeline for quantification of brain Aβ accumulation is still missing. This project aims to develop Q Amyloid, an open-access platform to automatically quantify brain Aβ burden.

Q Amyloid quantifies Aβ load using the Centiloid (CL) scale [1]. Structural Magnetic Resonance Imaging (T1-MRI) and PET data were downloaded from the GAAIN website for algorithm development, along with CL values, adopted as gold standards. The pipeline included MRI and PET scan preprocessing following the "standard method" [1], and a quality control step to assess its outcome. Individual Standardized Uptake Value ratios (SUVr) were then computed and converted to CL units [1]. The pipeline was evaluated on the 11C-PiB GAAIN dataset and subsequently calibrated on three additional ^{18}F-labeled radiotracers using the corresponding data available on GAAIN.

Evaluation of the Q Amyloid pipeline on the 11C-PiB GAAIN dataset demonstrated that the group mean SUVr values were within 2% of the gold standard, and that individual SUVr were highly correlated with the other fluorinated tracers (R^2=[0.902-0.962]) (Figure 1).

Once operational, the platform will receive subject-specific T1-MRI and PET scans as input and generate a report detailing the amyloidosis status. Q Amyloid will serve as a valuable tool in clinical trials, providing quantitative biomarkers to support early AD diagnosis.

This project is supported by the cascading grant "Q Amyloid – Quantitative Amyloid Imaging" under PNRR ECS00000017 "THE-Tuscany Health Ecosystem," Spoke 6: "Precision Medicine & Personalized Healthcare" funded by the European Commission through the NextGeneration EU programme.

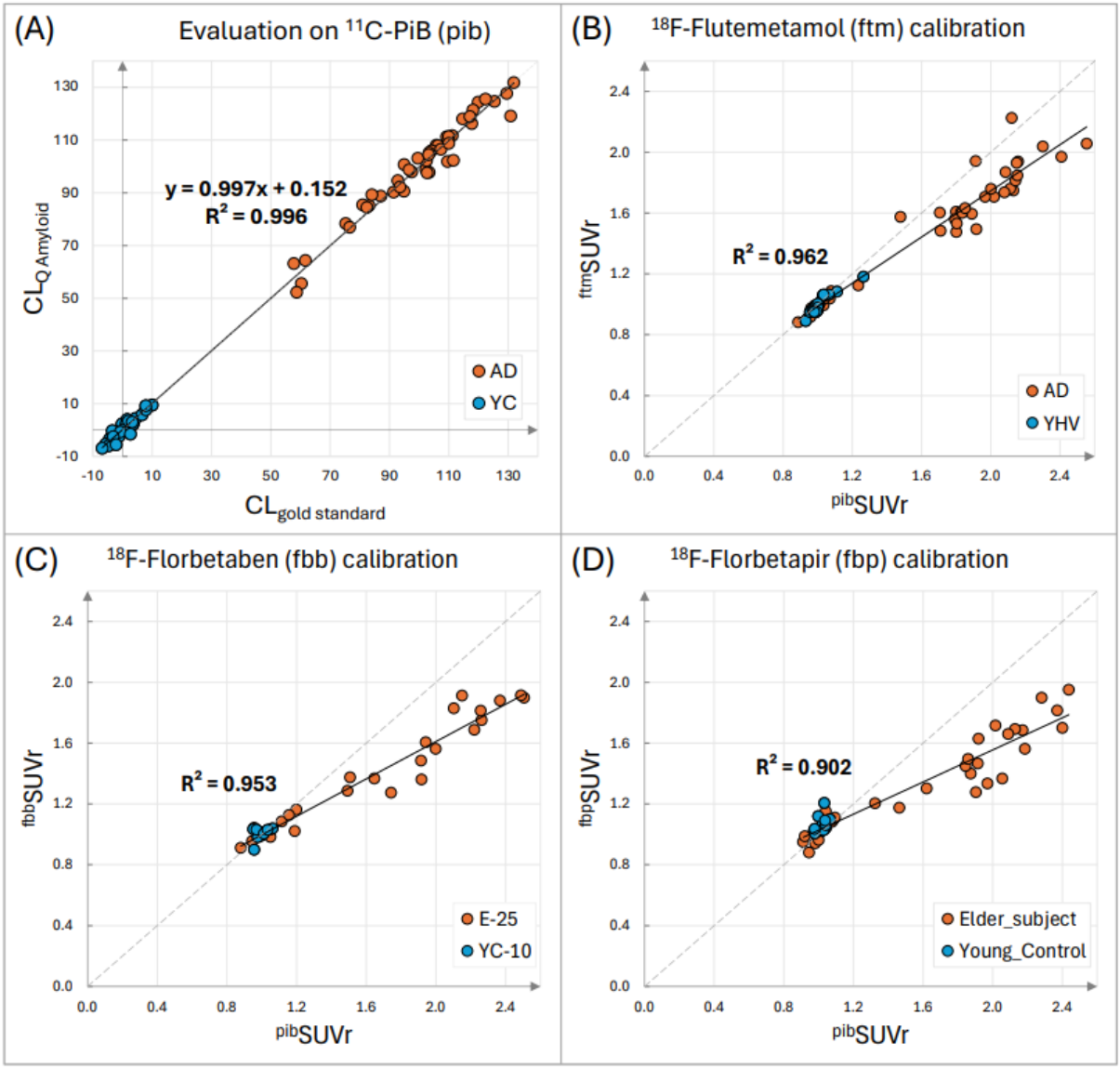

Figure. 1 (A) Q Amyloid-derived CL versus gold standard CL for 79 subjects (n=45 AD and n=34 YC). (B) Q Amyloid-derived paired pibSUVr and ftmSUVr for 74 subjects (n=50 AD and n=24 YHV). (C) Q Amyloid-derived paired pibSUVr and fbSUVr for 35 subjects (n=25 Elderly and n=10 Young Control). (D) Q Amyloid-derived paired pibSUVr and fbpSUVr for 44 subjects (n=31 Elder_subject and n=13 Young_Control). Data were obtained from the GAAIN database. AD, Alzheimer's disease; YC, Young Controls; YHV, Young Healthy Volunteers; E-25, Elderly; YC-10, Young Controls

References:

(1) Klunk, William E., et al. "The Centiloid Project: standardizing quantitative amyloid plaque estimation by PET." Alzheimer's & dementia 11.1 (2015)