

Supporting Information

Influence of the Physiochemical Properties of Superparamagnetic Iron Oxide Nanoparticles on Amyloid β Protein Fibrillation in solution

Morteza Mahmoudi^{1,2*}, Fiona Quinlan-Pluck³, Marco P. Monopoli³, Sara Sheibani⁴,
Hojatollah Vali⁵, Kenneth A. Dawson³, and Iseult Lynch^{3*}

¹Department of Nanotechnology, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran.

²Nanotechnology Research Centre, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran.

³Centre for BioNano Interactions, School of Chemistry and Chemical Biology, University College Dublin, Belfield, Dublin 4, Ireland

⁴Department of Chemistry and Chemical Engineering, Royal Military College, Kingston, Ontario K7K 7B4, Canada

⁵Department of Anatomy and Cell Biology, McGill University, Montreal, Canada

*Corresponding Authors

(M.M.) Web: www.biospion.com; e-mail: Mahmoudi@tums.ac.ir; (I.L.) e-mail:

Iseult.Lynch@cbni.ucd.ie

Supporting Figures

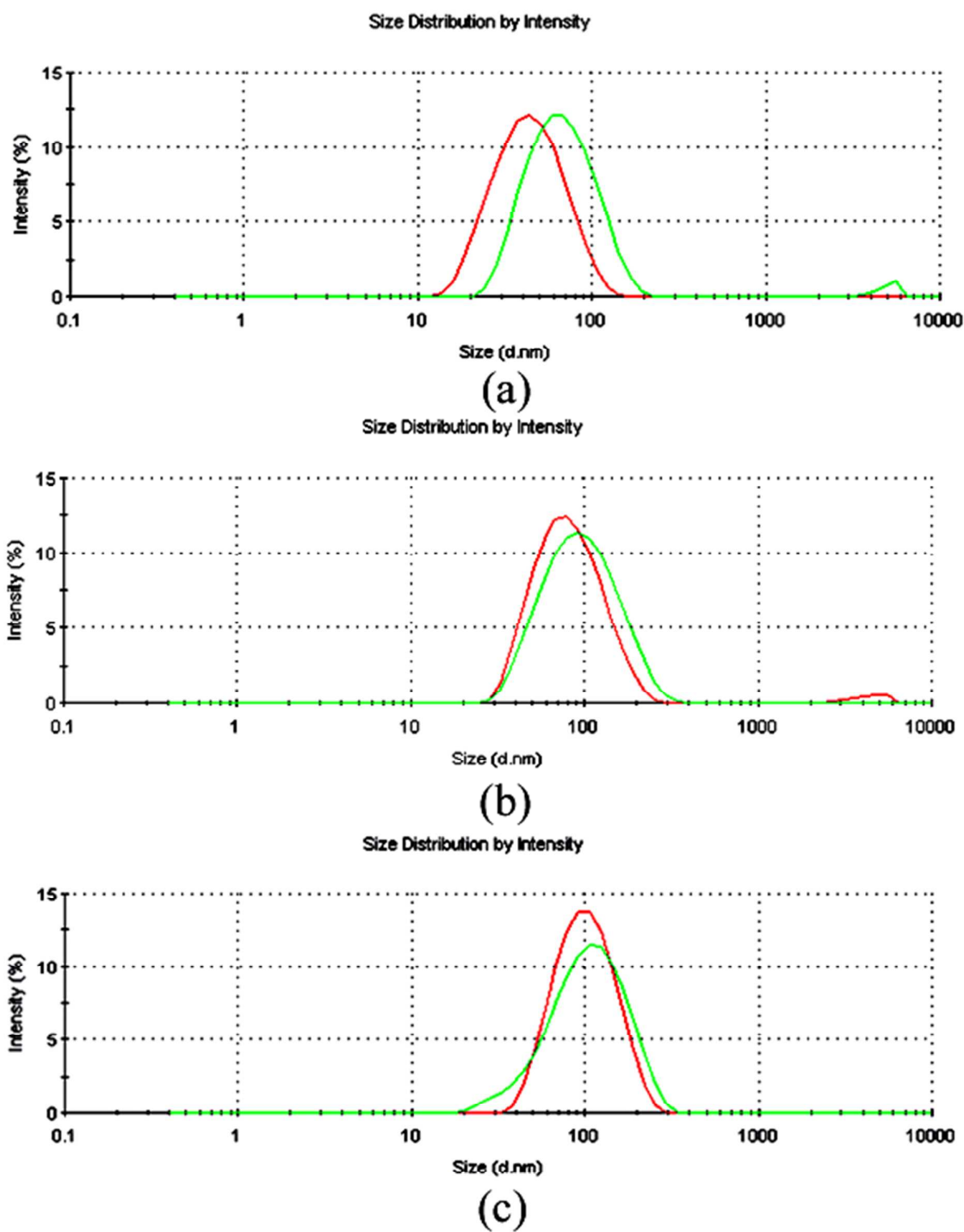


Figure S1: DLS curves of the single coated-SPIONs (red curves) and double coated-SPIONs (green curves) for (a) negative, (b) plain, and (c) positive dextran-coated SPIONs dispersed in PBS.

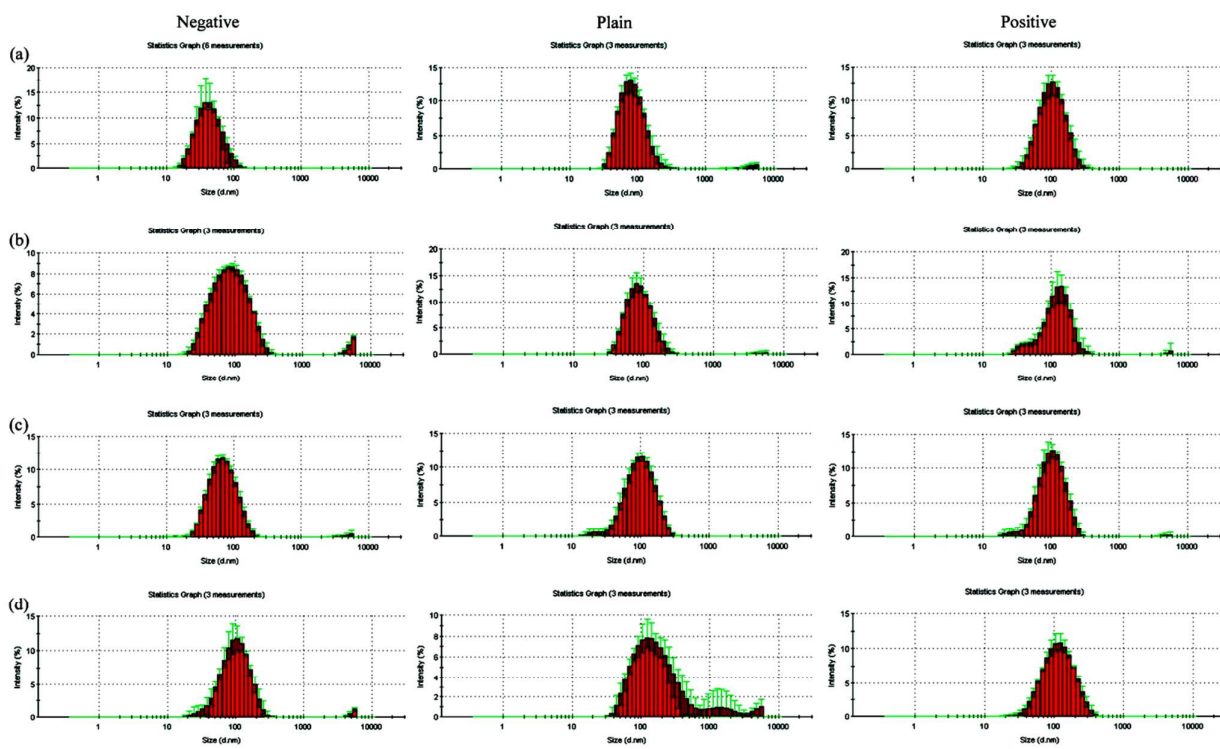


Figure S2: CONTIN distribution curves for the single coated-SPIONs dispersed in (a) PBS and (b) FBS. (c) and (d) CONTIN distribution curves for the double coated-SPIONs dispersed in PBS and FBS, respectively.

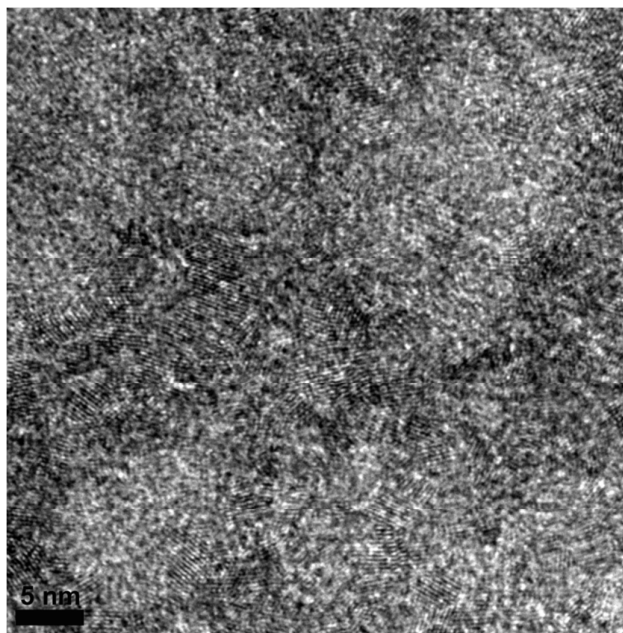


Figure S3. High resolution TEM image showing the lattice fringes of the SPION core for single coated COOH-dextran SPIONs.

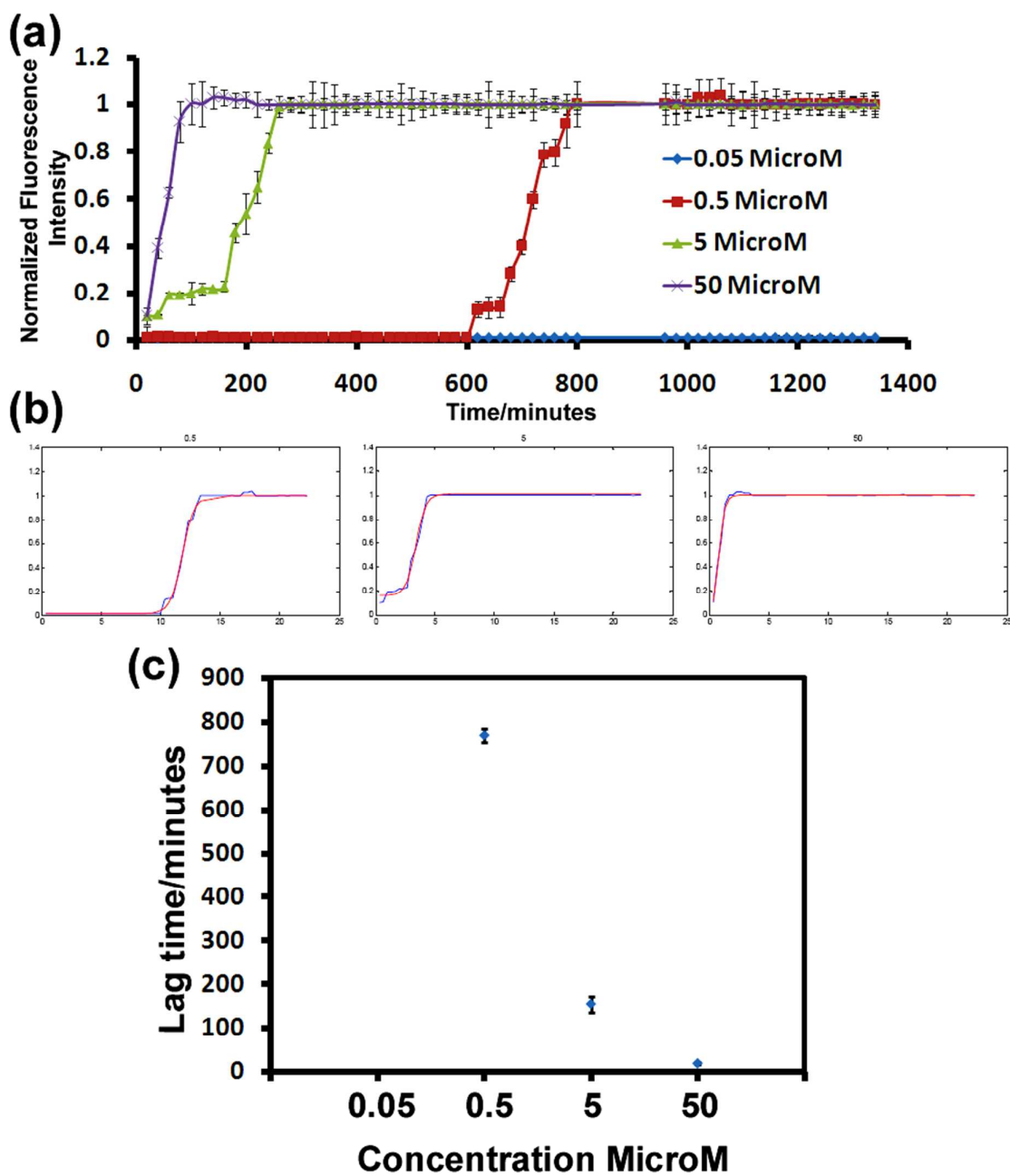


Figure S4. (a) Kinetics of A β aggregation at various A β concentrations monitored using ThT fluorescence; (b) Lines represent the best fit (red line) of equation 2 to the experimental data for A β concentrations of 0.5 μ M, 5 μ M, and 50 μ M, respectively (from left to right); (c) Lag times versus concentration of A β in solution from the experiments shown in (a).

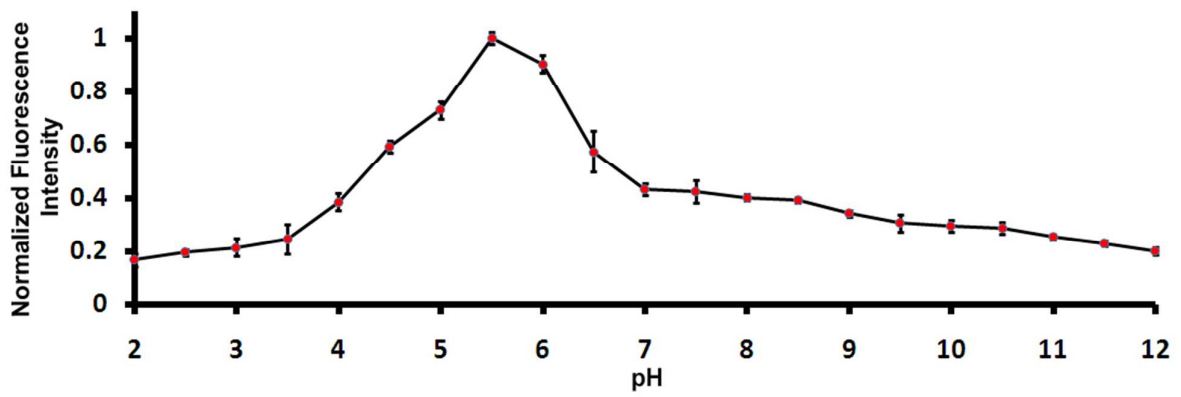


Figure S5. The pH dependence of Aβ oligomerization in solution.

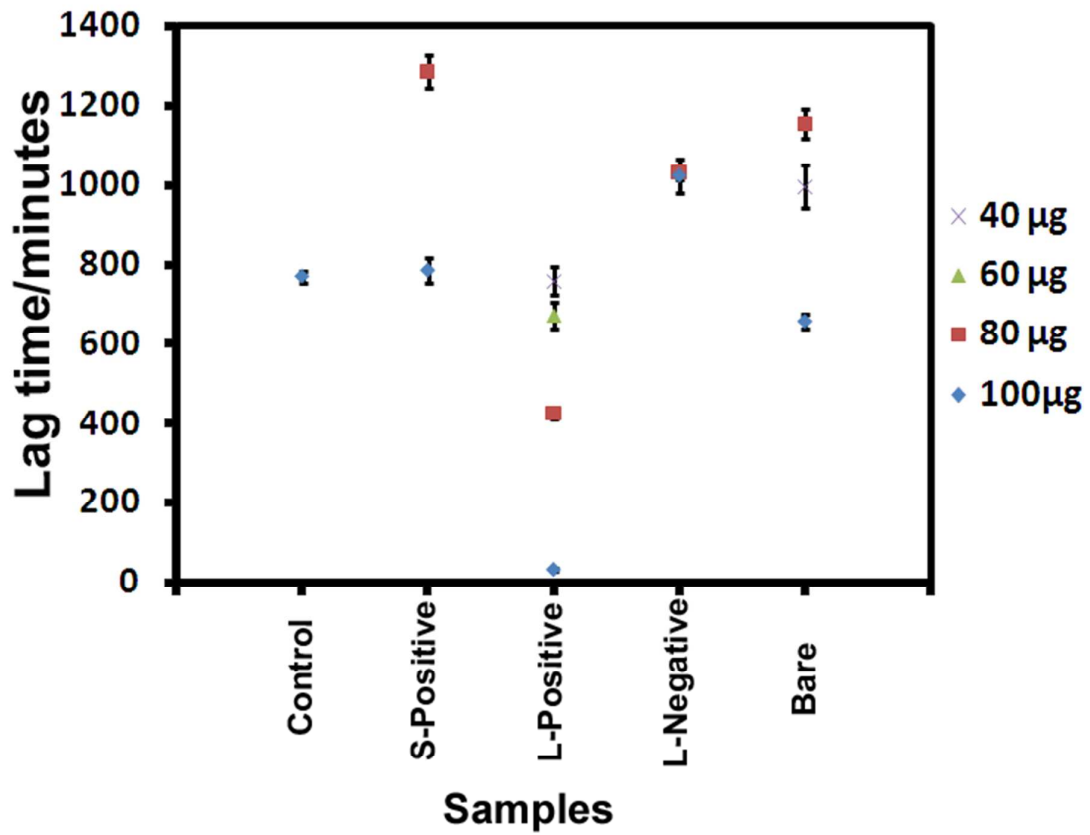


Figure S6. Lag times of A β fibrillation versus the variously charged single- and double-dextran coated SPIONs as a function of SPION concentration, as determined from the experiments shown in Figure 4 a-d; note that the lag time of plain particles and S-Negative particles are more than 1400 minutes.

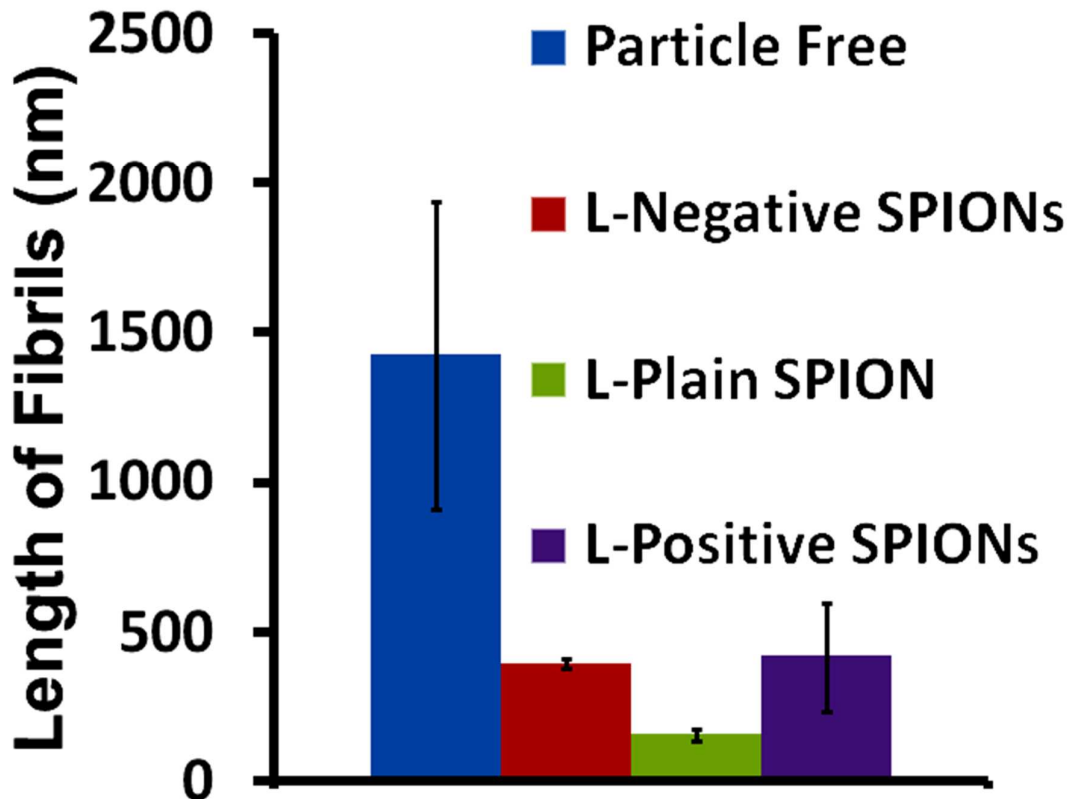


Figure S7: Size of A β fibrils under various incubation conditions (i.e. free from particles and upon incubation in solution containing 100 $\mu\text{g/ml}$ of the double-dextran coated SPION series (negative, plain and positively dextran coatings), as determined from TEM images (50 fibrils were considered and their sizes were calculated using photoshop software).

Table S1: Wavelength and corresponding minimum and maximum ellipticities of CD spectra of A β alone, various SPIONs alone, and the mixtures of A β and different concentrations of the various SPIONs.

	Concentration	λ (nm)	min/max [θ]	λ (nm)	min/max [θ]
A β (After 100 min incubation)	0.5 μ M	207	-2.81	222	-0.12
A β (After 1340 min incubation)	0.5 μ M	200	3.06	215	-13.03
Bare (alone)	100 μ g/ml	195	-0.23	208	-2.5
Bare (with A β)	40 μ g/ml	203	-31.95	215	2.86
	60 μ g/ml	205	-34.87	219	0.23
	80 μ g/ml	202	-30.34	217	2.95
	100 μ g/ml	201	-32.54	215	3.01
S-Negative (alone)	100 μ g/ml	195	-0.13	208	-2.3
S-Negative (with A β)	40 μ g/ml	206	-12.29	220	-0.12
	60 μ g/ml	206	-12.32	221	-2.07
	80 μ g/ml	205	-12.12	220	-2.21
	100 μ g/ml	207	-12.38	220	-2.48
S-Plain (alone)	100 μ g/ml	193	0.16	207	-2.11
S-Plain (with A β)	40 μ g/ml	203	11.98	217	-5.87
	60 μ g/ml	206	-11.98	220	-0.07
	80 μ g/ml	205	-11.65	220	-0.17
	100 μ g/ml	207	-18.35	222	-0.11
S-Positive (alone)	100 μ g/ml	196	-2.92	207	-0.21
S-Positive (with A β)	40 μ g/ml	204	-18.25	218	2.21

	60µg/ml	204	-29.83	219	2.11
	80µg/ml	201	-22.78	216	3.08
	100µg/ml	200	-39.46	215	3.17
L-Negative (alone)	100µg/ml	194	-0.28	209	-2.12
L-Negative (with Aβ)	40µg/ml	207	-10.04	220	-2.01
	60µg/ml	207	-9.07	222	-2.53
	80µg/ml	203	-25.23	217	2.56
	100µg/ml	202	-29.87	216	2.03
L-Plain (alone)	100µg/ml	193	+0.21	206	-1.93
L-Plain (with Aβ)	40µg/ml	207	-8.07	221	-2.54
	60µg/ml	207	-6.04	222	-2.65
	80µg/ml	206	7.01	221	-2.81
	100µg/ml	207	-5.01	222	-2.85
L-Positive (alone)	100µg/ml	195	-0.28	208	-1.9
L-Positive (with Aβ)	40µg/ml	200	-32.98	215	3.17
	60µg/ml	201	-37.45	215	3.02
	80µg/ml	200	-43.23	215	3.12
	100µg/ml	200	-48.12	215	3.78