Functionalized PEGylated Poly(Alkyl Cyanoacrylate) Nanoparticles for Applications in Alzheimer’s disease

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Alzheimer’s disease is a neurodegenerative pathology that affects more and more aging population worldwide. It is mainly characterized physio-pathologically by the accumulation of plaques of aggregated amyloid β peptide 1-42 (Aβ_{1-42} peptide). This is actually why scientists have focused more and more attention in the last years on the development of molecules, nanosystems able to efficiently interact with the aggregates and destabilize them.

The work proposed here deals with the functionalization of copolymers of poly[methoxy(polyethylene glycol) cyanoacrylate-co-hexadecylcyanoacrylate] (P(MePEGCA-co-HDCA)), known to be biocompatible and biodegradable, with appropriate ligands (i.e., selegiline and curcumin) by 1,3 Huisgen’s dipolar cycloaddition. The resulting functionalized P(MePEGCA-co-HDCA) nanoparticles, prepared by the nanoprecipitation technique, were characterized and their interactions with the Aβ_{1-42} peptide were evaluated by different technics (surface plasmon resonance, capillary electrophoresis).

It has been observed that the selegiline functionalized nanoparticles are not stable enough to be suitable for further studies, mainly due to rearrangement of ligands at their surface, while curcumin functionalized NPs showed some enhance affinity for the peptide when compared to non-functionalized NPs.

Due to not enough significative interactions of the above-mentioned ligands, the work undertaken in the lab is now directed towards the synthesis of anti-Aβ_{1-42} peptide antibody functionalized NPs for more specific interactions.