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**Bruno Franchi\*** ([bruno.franchi@unibo.it](mailto:bruno.franchi@unibo.it)), Department of Mathematics, University of Bologna, 4026 Bologna, BO, Italy. *Mathematical Models for Alzheimer's Disease*.

(in collaboration with M. Bertsch, V. Meschini, M.C. Tesi & A. Tosin) We propose a mathematical model for the onset and progression of Alzheimer's disease based on transport and diffusion equations. We treat brain neurons as a continuous medium and structure them by their degree of malfunctioning. Three different mechanisms are assumed to be relevant for the temporal evolution of the disease:

- diffusion and agglomeration of soluble peptides of Amyloid beta,
- neuron-to-neuron prion-like transmission of the disease and
- effects of phosphorylated tau protein.

We model these processes by a system of Smoluchowski equations for the Amyloid beta concentration, an evolution equation for the dynamics of tau protein and a kinetic-type transport equation for the distribution function of the degree of malfunctioning of neurons. The latter equation contains an integral term describing the random onset of the disease as a jump process localized in particularly sensitive areas of the brain. We are particularly interested in investigating the effects of the synergistic interplay of Amyloid beta and tau on the dynamics of Alzheimer's disease. (Received July 29, 2020)