# From a single disease to a complex syndrome – the challenge of Alzheimer's disease and novel research strategies

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In the face of an aging population and increased life expectancies in different countries, Alzheimer's disease (AD) emerges as a major public health problem of the industrial world. Despite decades of research and significant financial investments, physicians can offer patients very limited therapeutic options that can merely somewhat delay the progression of dementia but not curing this devastating disease. This reality calls for reassessment of current research directions and for the development of new therapeutic strategies.

While the vast majority of AD cases onset sporadically, the minority of cases develop as familial, mutation-linked illnesses. These familial cases provided hints that enabled researchers to unveil the molecular mechanisms that underlie the development of AD. A significant breakthrough in the research of AD was achieved when a family of aggregative peptides, which were termed "Amyloid Beta (Aβ) peptides", was identified as the major component of the amyloid plaques that are typically seen in brains of AD patients. The understanding that Aβ-containing plaques are correlated with AD has led to the development of the "amyloid hypothesis", a theory which proposes that familial AD-linked mutations enhance Aβ production and deposition. Nevertheless, it was recently discovered that different AD cases exhibit dissimilar biochemical properties, in some cases Aβ production is increased while in other cases it is decreased.

These findings indicate that more than one mechanism can underlie the development of AD and point at two major challenges. First, a detailed classification of AD sub-types is critically needed to better understand what mechanism is accountable for the manifestation of AD in each individual patient. In addition, new drugs that target different aspects of the disease should be developed. One promising research direction that was proven to be beneficial to delay AD-like disease in model organisms is based on the observation that neurodegenerative disorders onset late in life. Accordingly, the alteration of aging by inhibiting the activity of hormonal signaling cascades downstream of IGF-1 delays the onset of AD and slows its progression once emerged. Thus, IGF-1 inhibitors will be most likely key components of future, counter AD therapeutic cocktails.