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Alzheimer's disease research in the 21st century: Past and current failures and the way forward

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Statement of the Problem: Animal models of Alzheimer's Disease (AD) have been extensively utilized in the last few decades in an effort to elucidate the pathophysiological mechanisms of the disease and to test novel therapeutic drugs. However, basic/fundamental and pre-clinical research successes have not translated into effective therapeutic treatments for AD patients. One of the possible reasons behind this translational failure may be the over reliance on animal models for AD, which have been shown useful to recapitulate some AD-associated features, such as amyloidosis and tauopathy, but have failed to deliver effective treatments for AD patients. On the other hand, the use and the implementation of human-based investigational methods, non-invasive neuroimaging technologies and large-scale epidemiological data set repositories, may contribute to the development of new preventive and treatment strategies.

Method: Here we present the challenges and opportunities in AD research and propose how we can mitigate this translational barrier by employing human-based methods to elucidate disease processes occurring at multiple levels of complexity (from gene expression to protein, cellular, tissue/organ to individual and population level). Novel human-based cellular and computational models are already being applied in toxicology and regulatory testing and could be associated with non-invasive neuroimaging tools and epidemiological data to facilitate human-relevant data discovery.

Conclusion: A paradigm shift towards human-based research, accounting for a multi-dimensional and multi-disciplinary approach is highly needed to tackle the ever-increasing prevalence of AD in the 21st century.

Biography

Francesca Pistollato is currently working at the European Union Reference Laboratory for Alternatives to Animal Testing (EURL ECVAM) Joint Research Centre in Ispra, Italy. She develops and supports the use of alternatives to animal testing in toxicology and regulatory testing and in biomedical research. She previously worked at the Physicians Committee for Responsible Medicine (PCRM), Washington DC, advocating for the use of a holistic, human-based approach for Alzheimer's disease research. She has completed master's degree in Nutrition and Dietetics and published several works on the role of nutrition and lifestyle-related factors in the prevention of chronic degenerative diseases, such as Alzheimer's and dementia.

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