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Special supplement

Collaborations are key to successful drug development in precision medicine

Advances in oncology as a blueprint for the prevention and treatment of neurodegenerative diseases

Andrea Pfeifer, Ph.D., CEO, AC Immune S.A.
Bill Martin, Ph.D., Global Therapeutic Area Head, Neuroscience, Janssen Research & Development, LLC

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Currently, more than 55 million people worldwide suffer from dementia, and this number could rise to 139 million by 2050 if we do not act. Dementia alone generates one trillion U.S. dollars annually in healthcare costs and leads to a high incidence of depression and stress-related illnesses among families and caregivers.

In late September, it was announced that an anti-Abeta monoclonal antibody had slowed cognitive decline in early Alzheimer's disease in a Phase 3 trial. Until then, it might have felt like there had been no significant progress in Alzheimer's research. However, as these latest news show, the opposite is true, and should encourage further efforts, the use of financial resources and concerted cooperation between the different stakeholders.

Cancer treatment could serve as a blueprint. Only forty years ago, more than two thirds of all patients died of their cancer. Precision medicine contributed significantly to the fact that today, many people living with cancer have a good chance of full or partial regression or at least a slowed progression of the disease.

Advances in molecular biology and the advent of precision medicine have revolutionized the treatment of certain cancers. Thanks to a more detailed diagnosis of tumors, treatments can be better adjusted, which in turn leads to a higher success rate. Oncology no longer treats broadly, but looks for specific mutations in suspected genes, which are then targeted.

Multifactorial diseases

The treatment of neurodegenerative diseases is equally complex, as they are based on numerous factors. Now we know that in Alzheimer's disease, brain cells die because biological processes that play a specific role in the healthy brain gradually shift out of balance. Proteins produced by one's own brain undergo subtle deformations, so-called misfolding, and change their binding properties. The result is that they clump together and form aggregates. These aggregates are toxic to our brain cells and lead to neurodegeneration.

Multiple proteins interact and their proportions vary between patients, which further complicates reliable diagnosis and thus treatment. Precision medicine may be the most promising approach to address this complexity. Like cancer, we need to work toward evolving beyond non-specific treatment and move to targeted interventions against individual protein diseases.

To stop neurodegenerative diseases, we believe one of the best solutions is to prevent the accumulation of toxic proteins before they cause irreversible damage in the brain.

We need diagnostics for earlier detection of the various pathological proteins as well as disease-modifying drugs to eliminate them quickly. Both need to be tested, improved, and validated in clinical trials. Research has systematically made progress and learned from previous clinical trials. Ten years ago, the necessary tools to diagnose and monitor disease progression did not exist. It became clear only later that patients' disease profiles were not accurate enough, because these were often based on clinical symptoms. Subsequent analyses showed that for some studies, the pathological protein targeted by the therapeutic under evaluation was absent in up to a third of the patients, hence compromising chances of a positive outcome.

Today, advances in blood tests and imaging techniques are continuously improving our understanding of neurodegenerative diseases. The latest tools are being introduced into clinical trials more rapidly to allow not only more accurate characterization of patients - based on biomarkers - but also to better understand the mechanisms of action of therapeutics. The optimal dose and the best time to intervene can thus be determined more quickly - which in turn increases the likelihood of successfully slowing or even stopping the progression of the disease.

Researchers have identified numerous biomarkers for Alzheimer's disease, which might soon be used to predict who is at increased risk of developing the disease. These advances pave the way for interventions such as immunotherapies to avert the accumulation of toxic proteins – similar to how statins are used to manage high blood cholesterol levels and reduce the risk of cardiovascular disease. Active immunotherapies, which are designed to prime the patient's immune system to produce the necessary antibodies and to remove toxic proteins from the brain as soon as these are detected, may be well suited to slow down or prevent accumulation of toxic proteins.

To achieve this ambitious goal as quickly as possible, we need collaborations. The total cost of an Alzheimer's drug development program is estimated at 5.6 billion US dollars, and the process takes about 13 years from preclinical studies to the first market approval. It takes tremendous funding, global clinical trials, and solid scientific research for these fields to develop in lockstep and benefit from each other. Therefore, open exchange between investors, pharmaceutical and biotech companies, clinicians, and researchers is important to achieve implementation and rapid use of new expertise and technologies.

Improved planning and conduct of clinical trials significantly accelerate drug development for neurodegenerative diseases. However, the benefits of close cooperation extend beyond clinical development. To bring the approved drug as quickly as possible to patients worldwide, you also need the global manufacturing and quality control infrastructure and the commercial logistics network for distribution.

The breakthrough is approaching

We are now approaching a potential breakthrough in Alzheimer's care/treatment, thanks to early identification of at-risk groups, we may be able to fight the disease much earlier with immunotherapy. In about ten years, it could be possible to prevent neurodegeneration before it occurs through safe and innovative therapeutics. In the meantime, we also need closer cooperation with media to improve public awareness of dementia, its diagnosis and prevention options.

We are not powerless in the face of dementia and neurodegenerative diseases. Today, we believe adapting our lifestyles can potentially reduce the impact of dementia and tomorrow, we will hopefully have preventive therapeutics. The latter requires dedicated collaboration between biotech and pharma, regulatory and governmental organizations. Together we will succeed faster.