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Cell Aging Clocks to Measure and Predict Diseases of Aging

Old age is attributed to over fifty percent of the global disease burden. While aging is a sign of normal development early in life, it leads to the loss of youthful traits and bodily function in later years. The aging process is thought to arise from a combination of genetics, lifestyle, and environmental exposures that manifest at the scale of the whole body, organ, and cell. Strikingly, one's risk of neurodegenerative disease - including Alzheimer's disease (AD) and Parkinson's disease (PD) - increases twofold for each elapsed five calendar years, with onset being largely heterogeneous among adults 65 years and older. Despite being a known determinant of disease, the aging process itself remains poorly understood. To this end, a detailed biological characterization of human aging could enhance our current understanding of the diagnosis, treatment, and prevention of neurodegeneration.

To understand factors of aging that leads to aging and neurodegenerative diseases, the Wyss-Coray Lab has developed machine learning models to efficiently classify distinct patterns of cell-specific aging. Using the models, the inventors have successfully estimated the biological age of 43 distinct cell types including those of neuronal, immune, glial, endocrine, epithelial, musculoskeletal, and mesenchymal origin. The results also identified biomarkers that are uniquely associated with neurodegenerative diseases, such as amyotrophic lateral sclerosis (ALS) and Alzheimer's disease. The invention provides a prospective tool that can help reveal cellular underpinnings of neurodegenerative disease risk, providing granular insights into the role of heterogeneous aging in human health.

Applications

- Biomarkers of aging and age-related disease
- Stratification of patients into clinical trials
- Companion diagnostic markers

- Secondary outcome biomarkers of drugs targeting aging or age-related diseases

Advantages

- No similar indicators of cell age exist
- Complementary with existing organ age clocks
- Provides more granularity to existing age clock models

Innovators

- Anton Wyss-Coray
- Yi Ding
- Veronica Bot

Licensing Contact

Mona Wan

Senior Licensing Manager for Special Projects

Email