

A CUTTING-EDGE DIAGNOSIS ON BRAIN-AGING PREVENTION

L. Spiru I. Turcu

Ana Aslan International Academy of Anti Aging

In the context of global population aging and its economical and societal burden challenges, the improvement of older adults' health by encouraging them to adopt healthier behaviors and obtain regular health screenings that could reduce the risk for many chronic diseases, help to decrease health disparities, to lower health care costs, to improve life quality of old people, to keep them socially inserted and allow the use of their resting workforce.

Our presentation deals with the three main sore points of this struggle: 1. understanding healthy versus pathological brain aging; 2. elaboration of the most accurate and powerful diagnosis tools; 3. elaboration of those preventive and curative, medical and non-medical algorithms able to delay as much as possible the onset of age-related brain pathology.

The first section, "Normal Versus Pathological Aging" reviews the cut-edge insights related to natural changes that occur during aging in the absence of disease, their cultural, gender and bio-medical particularities, and points out the debates in the field around the true impact of neuronal loss and huge individual variation. The causal aspects of aging are also overviewed, with focus on the most relevant ones (programmed versus wear & tear aging, free radical theory, glycation theory, glucocorticoid cascade hypothesis, stress and depression impact and management, the crucial role of inflammation-related events and the impact of C1q protein activation, telomeres as the aging pacemaker and the hope of gene therapy, sirtuins in the context of apoptosis and possible methods for their activation, presenilin mutations, notch protein in the context of neurogenesis etc. A synopsis related to the dynamics of pathological brain aging is also commented. A special attention is paid to the most debated pathological entity of MCI and its conversion to the severe forms of dementias, taking into account that this syndrome is a pathological stage that still allows fruitful medical and non-medical interventions and is early diagnosis is crucial.

The second part, "Cut-edge tools in Brain Aging Diagnosis" is tailored on the review of the most actual and accurate specific tools, from metabolomic and epigenomic markers to sophisticated imagistic systems able to reveal the onset of pathological events earlier as possible, before their clinical expression. The two main battle fields – health vs. pathology screening methods elaboration and powerful, high-sensitive markers discovery in the context of the extraordinary technological progress of nowadays, are called into discussion. The difficulties of Alzheimer's Disease diagnosis are commented and the 10 warning signs as defined by J. Marcell (2005) are envisaged. The requirement of an as complex as possible evaluation is especially pointed out. The presentation overview the predicting value of weight and smell sense changes, as well as that of gait impairment, and overview the most actual brain imagery diagnosis tools: Single photon emission tomography, FDDNP-PET scans, FDG-PET scans, Pittsburgh Compound B usage for the evaluation of Mild Cognitive Impairment to Alzheimer's Disease Conversion, fMRI imaging of the brain while it thinks and its usage for pore memory visualization, PET-CT imaging systems, MRI as an instrument to assess dangerous iron in living brain, brain imaging tools for bipolar depression diagnosis, etc. Brain SPECT Atlas of human behavior is signaled as well. As other diagnosis instruments of last generation: a new brain test based on standard EEG able to predict dementia, 'Brain Fingerprinting' for AD monitoring, a Brain Connectivity Assessment Tool, the Transcranial Doppler Sonography – TDS that helps psychologists measure attention levels, are presented among others. The 'section' dedicated to the new, powerful serologic and other biological fluids markers comprise specific AD risk proteins in the blood, marker targeting nerve cells' energy, the now available Alzheimer's ApoE Genome Test, molecular biomarkers other than those using antibodies, the novel strategy of prions' diagnosis in patients, the Cheap blood test that heralds speedy stroke diagnosis, 3D computer tests, interview methods and sophisticated brain imaging techniques putted together in order to investigate memory loss patterns at dementia onset, more sensitive psychological tests for AD prediction, techniques related to the eye as window to the brain, etc.

The last section of the presentation critically overview the actual strategies, methods or algorithms in brain pathology prevention, with focus on those representing actual cut-edge acquisitions in the field: the healthy aging model including physical and brain exercise, nutrition, cognitive training, spirituality, stress management and social support is commented. Brain plasticity management and specially elaborated brain fitness programs are mentioned, aside to the novel deep-brain stimulation techniques, astrocytes stimulation techniques for beta-amyloid cleaning, the strive to develop microglia able to engulf and remove beta-amyloid aggregates and techniques for the stimulation of TGF- β growth factor production. A special attention is paid to gene therapy attempts, such as Neprilysin gene delivery system created at Salk Institute for Biological Studies - La Jolla, California. Enhancement of neurogenesis in order to develop new therapeutic approaches and Notch protein as a new target for therapeutic interventions are also called into attention. Perispinal Etanercept administration as a novel approach to Alzheimer's treatment in an UCLA study (2008) is underlined as an example of the new trend of discovering novel utilizations for old geriatrics' arsenal. The 10 Ways to Combat Alzheimer's Disease as formulated by Wesson Ashford are pointed out, together with the long-term use of non-steroidal anti-inflammatory drugs (NSAIDs) that is commented. The recent insight that the brain protects itself is underlined and brain's ability to repair itself after injury or neurodegeneration, until recently considered limited or non-existent, is argued, aside the mention of the emerging *concept of cognitive reserve* that changed that view.

The central conclusion of this presentation is that brain aging delay and brain pathology prevention resides in the accuracy and powerfulness of diagnosis tools as the first, decisive step.