Aluminum in neurological and neurodegenerative disease

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*communicating author; Email: wlukiw@lsuhsc.edu; the research work in this abstract is dedicated to the memory of DRC McLachlan BS, MD, FRSC, Order of Canada, and his lifelong investigation of aluminum in neurobiological systems and aluminum’s potential contribution to the etiology and neuropathology of Alzheimer’s disease.

Abstract

With continuing cooperation from 18 domestic-and-international brain banks over the last 37-years we have analyzed the aluminum-content of the temporal-lobe neocortex of 511 human female-brain-samples from 16 diverse neurological and neurodegenerative-disorders and age-matched controls. Temporal lobes (Brodmann A20-A22) were selected because of their availability and central-role in cognition and memory-formation. We used the analytical techniques of (i) Zeeman-type-electrothermal-atomic-absorption-spectrophotometry (ETAAS) and (ii) preliminary analysis using the advanced-photon-source (APS) device at the Argonne-National-Laboratory, US Department-of-Energy, University of Chicago IL, USA. Neurological diseases examined were Alzheimer’s disease (AD;N=186), ataxia-Friedreich’s type (AFT;N=6), amyotrophic-lateral-sclerosis (ALS;N=16), autism-spectrum-disorder (ASD;N=26), dialysis-dementia-syndrome (DDS;N=27), Down’s-syndrome (DS; trisomy-21;N=24), Huntington’s-chorea (HC;N=15), multiple-infarct-dementia (MID;N=19), multiple sclerosis (MS;N=23), Parkinson’s disease (PD;N=27), prion-disease (PrD;N=11), progressive-multifocal-leuko-encephalopathy (PML;N=11), progressive-supranuclear-palsy (PSP;N=24), schizophrenia (SCZ;N=21), a young-control-group (YCG;N=22) and an-aged-control-group (ACG;N=53). All pathological tissues were diagnosed after extensive-clinical and/or post-mortem examination. Amongst neurological-conditions we found a statistically-significant trend for aluminum to be significantly increased in AD, DS and DDS compared to controls. These results are the largest study of aluminum-association with neurological-neurodegenerative-disease ever undertaken. The results suggest that aluminum’s-association with AD, DD and DS brain tissues may-contribute-to-the-neuropathology-of those neurological disorders but may not be a significant-factor in other incapacitating-lethal diseases of the human CNS.

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