

ABSTRACT PER WINTER SYMPOSIUM

A novel data mining process discloses a global immunodeficit in Alzheimer and Mild Cognitive Impairment

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A growing awareness exists that pro-oxidative state and neuroinflammation are both involved in (A)lzheimer (D)isease (AD). However, how and at what degree they are related is still debated. Due to the expected non-linear correlations between oxidative and inflammatory markers, the use of traditional statistics may not be appropriate.

We evaluated the relationship between immunological and oxidative stress markers using (A)rtificial (N)eural (N)etworks (ANN). This advanced mathematical techniques has been successfully used to predict the value of specific risk factors in several fields of medicine.

An immune-phenotypic and functional analysis together with evaluation of a broad panel of oxidative stress markers were performed peripherally in a cohort of 74 AD, 26 (M)ild (C)ognitive (I)mpairment and 28 matched controls (HC).

TWIST system, an evolutionary algorithm followed by a novel ANN called KCM, reached the highest performance in distinguishing AD, MCI and HC. Among 27 immunological variables and 8 oxidative stress markers measured, TWIST identified 13 biological variables expressing the maximal forecasting meaning. Namely: CD4⁺ROR⁺; CD4⁺GATA⁺; CD4⁺IL22⁺; CD4⁺IL17A⁺; CD8⁺IFN γ ⁺; CD4⁺IL9⁺; CD8⁺IL21⁺; CD14⁺IL10⁺; CD14⁺IL6⁺; CD14⁺L12P35; CD14⁺IL23⁺; (P)lasma-(A)ntioxidant-(P)ower (PAO) and antibodies anti-oxidized (L)ow-(D)ensity-(L)ipoprotein (anti-ox-LDL).

Considering only variables selected by Twist, KCM distinguished AD, MCI patients and HC with an accuracy of 92.5%; 68.5%; 91.1%, respectively (overall accuracy= 84.06%).

A data mining performed by Auto-Cm-algorithm (another ANN), clearly defines the “area” of AD and MCI strenghtly associated to a global immunodeficit.

Th1 cells, as previously reported, but even Th2, functional M1 and M2 cells were overall decreased in AD and MCI. Low anti-ox-LDL and high PAO strongly associated to cognitive impairment, can be regarded as an indirect cause/effect of this deficit.

In conclusion, applying an innovative non-linear mathematical technique, a global immune deficit was shown associated to cognitive impairment. Both adaptive and innate immunity were peripherally defective in AD and MCI patients.

