INFRARED SPECTROSCOPIC ANALYSIS OF BLOOD AS A DIAGNOSTIC TOOL IN ALZHEIMER DISEASE

P. Carmona\textsuperscript{1}, A. Toledano\textsuperscript{2}, I. Alvarez\textsuperscript{2}, S. Fuiz\textsuperscript{2}, M. Molina\textsuperscript{3}, M. Calero\textsuperscript{4}, P. Martinez\textsuperscript{5}, F. Bermejo\textsuperscript{6}

\textsuperscript{1}Instituto de Estructura de la Materia (CSIC), \textsuperscript{2}Instituto Cajal (CSIC), \textsuperscript{3}Universidad Complutense de Madrid, \textsuperscript{4}Centro Nacional de Microbiología, ISCIII, \textsuperscript{5}AD Research Unit, Fundación CIEN, Centro Alzheimer F. Reina Sofía, \textsuperscript{6}Neurology Department, Hospital 12 de Octubre, Madrid, Spain

Introduction: Alzheimer disease (AD) is a problem of great importance due to its high prevalence worldwide, the elevated assistance costs, and many unsolved questions (i.e., causes, clinical-pathological types, disease-modifying treatments, etc.). Diagnosis still relies on neuropsychological testing, and neuroimaging is expensive and of limited accuracy.

Aims: Since proteins surrounding amyloid peptides can influence the structure of β-amyloid peptides, this investigation was aimed at the characterization by infrared spectroscopy (IR) of different fractions (cellular and non-cellular) of human peripheral blood that can be enriched in AD biomarkers.

Methods: Blood samples have been obtained from 14 control subjects and 39 AD patients at various disease stages, and divided into cellular and non-cellular fractions by differential centrifugation. Freshly prepared blood fractions were deposited on ZnSe windows, air-dried and the IR spectra acquired in a Perkin-Elmer 1725X spectrometer.

Results: All the different blood fractions analyzed presented IR spectra dominated by protein and lipid bands. Resolution enhancement of the protein amide I band (1700-1600 cm\textsuperscript{-1}) allowed us to quantitate the contribution of β-sheet structures in the 1640-1620 cm\textsuperscript{-1} range. Significant increasing in percentage of β-sheet structures was observed in most blood fractions, particularly in leukocytes from AD patients (~11.5%-19.4%) compared to controls (~6.7%-9.8%).

Conclusions: Quantitative IR spectroscopic analysis of total β-structures in blood fractions appears to be able to distinguish AD patients from controls. Further studies within other spectral regions and the analysis of more AD and control samples are needed to confirm the usefulness of IR spectroscopy as a biomarker for AD.