



Enhanced Laser-Induced Breakdown Spectroscopy (LIBS) techniques for autism diagnosis in children

Rosalba Gaudiuso^{1,*}, Milica Vinić¹, Immacolata C. Tommasi¹, Andrea De Giacomo², Caterina Gaudiuso³, Francesco P. Mezzapesa³, Antonio Santagata⁴, Maria L. Pace⁴, Lucrezia Catanzaro⁵, Luisa D'Urso⁵, Giuseppe R. Compagnini⁵

¹ Department of Chemistry, University of Bari "A. Moro"

2. Department of Translational Biomedicine and Neurosciences, University of Bari "A. Moro"

3. Institute of Photonics and Nanotechnology – CNR, Bari

4. Institute of Structure of Matter – CNR, Potenza

5. Department of Chemical Sciences, University of Catania

*Corresponding author email: Rosalba.gaudiuso@uniba.it

Epidemiological surveys indicate that Autism Spectrum Disorder (ASD) cases are on an increasing trend worldwide. The etiology of this multifactorial neurodevelopmental disorder is still unclear, but it is thought to be linked to both genetic and environmental factors [1]. Among the latter, exposure to neurotoxicants, and particularly to metallic pollutants, is increasingly thought to play a significant role in the onset of ASD in pediatric patients. While early diagnosis is crucial, ASD nowadays is still largely diagnosed based on behavioral evaluation and developmental history, with two typical pitfalls: 1) different disorders can manifest with similar symptoms; 2) behavioral changes may go unnoticed and the disorder undiagnosed for extended periods of time.

In this work, we present our first results on the development of a spectroscopic method to obtain a metallic profile linked to ASD with the goal of improving the accuracy of its diagnosis and, in the medium-long term, its treatment and prevention. To this end, we employed Laser-Induced Breakdown Spectroscopy (LIBS) to interrogate aqueous solutions and microdrops of blood serum deposited and dried on solid substrates and withdrawn from ASD subjects and healthy controls.

Moreover, we will discuss the effect on the intensity of LIBS spectra intensity, and on the consequent classification ability, of two substrate-modification methods for the analysis of trace elements, the first based on the generation of Laser-Induced Periodic Surface Structures (LIPSS), the second based on the substrate functionalization with noble-metal nanoparticles, prior to the LIBS analysis of the deposited fluids.

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Reference:

[1] J.K. Kern et al, Journal of Trace Elements in Medicine and Biology 38 (2016) 8.