

ANALYSIS OF URINARY ORGANIC ACID PROFILES IN CHILDREN WITH AUTISM SPECTRUM DISORDERS: A CASE-CONTROL STUDY

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BACKGROUND

Autism spectrum disorders (ASD) are neurodevelopmental conditions characterized by impaired social interaction, atypical use of language, and repetitive or stereotyped behaviors. Clinical diagnosis relies mainly on phenotypic criteria (DSM-5), while the search for objective biomarkers for ASD identification and etiological understanding is ongoing. This study compared urinary organic acid profiles of children with ASD to those of typically developing (TD) children, aiming to identify potential diagnostic biomarkers

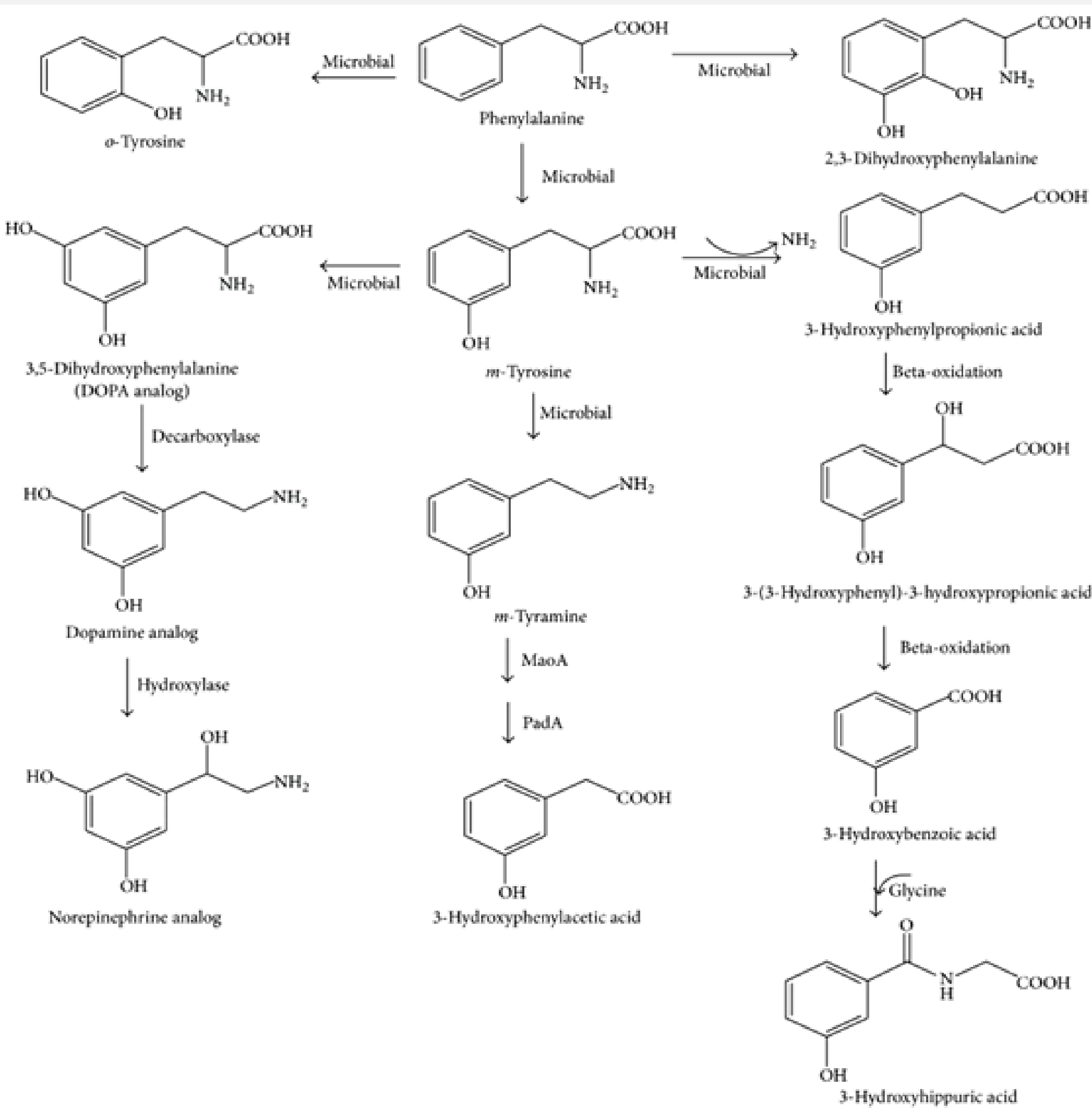


Fig.1 Microbiota-mediated phenylalanine metabolic pathway leading to the formation of 3-hydroxyphenyl 3-hydroxypropionic acid

METHODS

Urine samples were collected from children diagnosed with ASD according to DSM-5 criteria and from healthy TD controls, between August 2023 and December 2024. Subjects with concomitant metabolic disorders were excluded. In total, 30 ASD samples, 15 age- and sex-matched controls, and 7 random samples were analyzed. Urine samples were treated with 6N HCl and organic acids were extracted with a validated method. Metabolites were derivatized with BSTFA. All samples (ASD, non-ASD, and control) were spiked with an internal standard. Analysis was performed by GC-MS using an Agilent system. Data were subjected to canonical discriminant analysis (CDA) to identify discriminating metabolites.

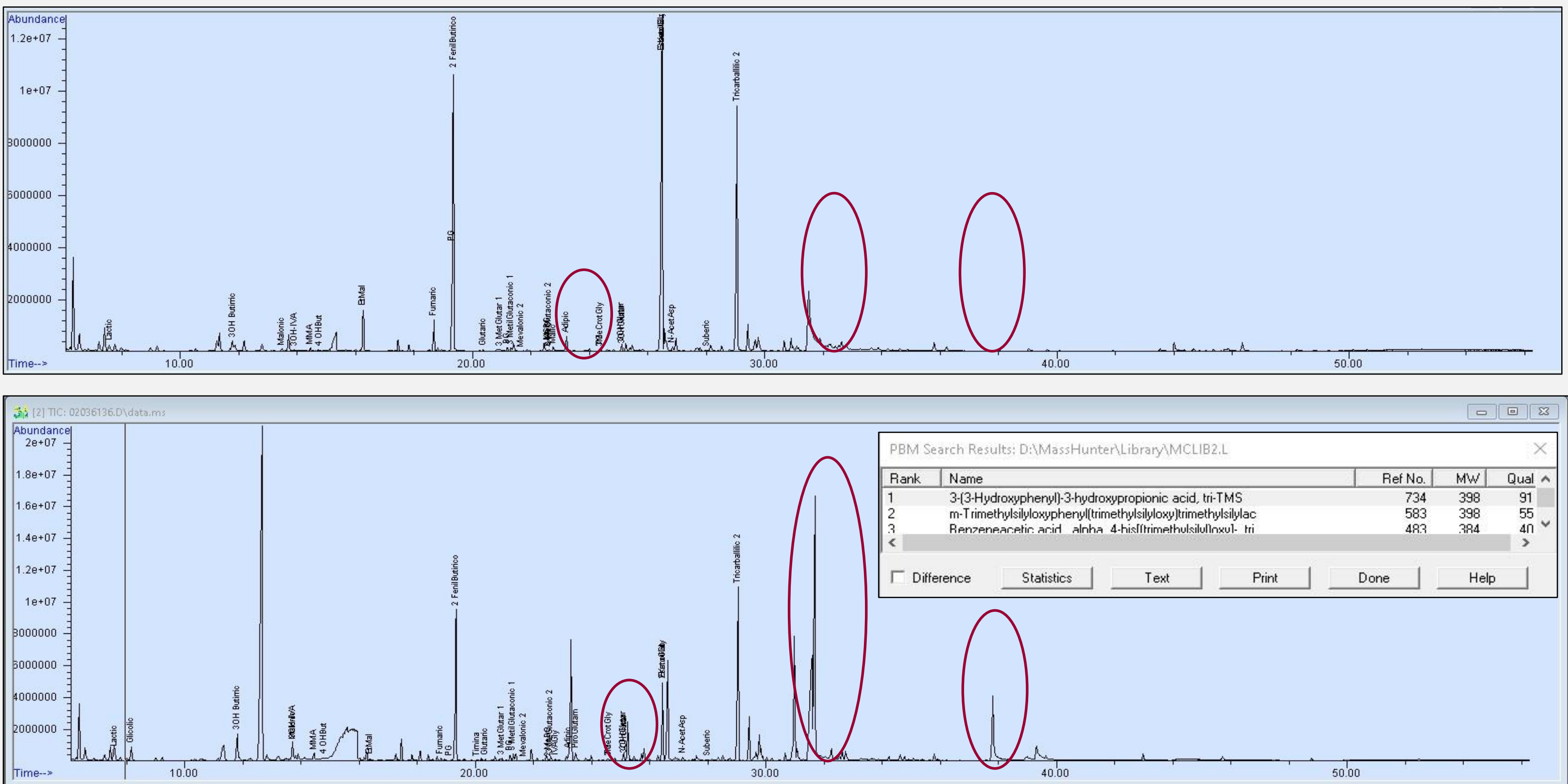


Fig.2 Representative GC/MS chromatograms of the control group and the ASD group after chemical derivatization

CONCLUSIONS

The findings suggest that specific urinary metabolites, particularly phenolic derivatives, may represent valid biomarkers for ASD diagnosis and pathogenesis studies. Further research with larger sample sizes and longitudinal analysis is required to confirm these results and clarify the role of altered metabolic pathways in ASD.

RESULTS

Significant differences were found between ASD and control groups in three urinary organic acids: 3-(3-hydroxyphenyl)-3-hydroxypropionic acid (3-HPHPA), 3-hydroxyphenylacetic acid (3HPA), and 3-hydroxyhippuric acid (3HHA). All three compounds emerged as potentially discriminating biomarkers ($p < 0.05$).

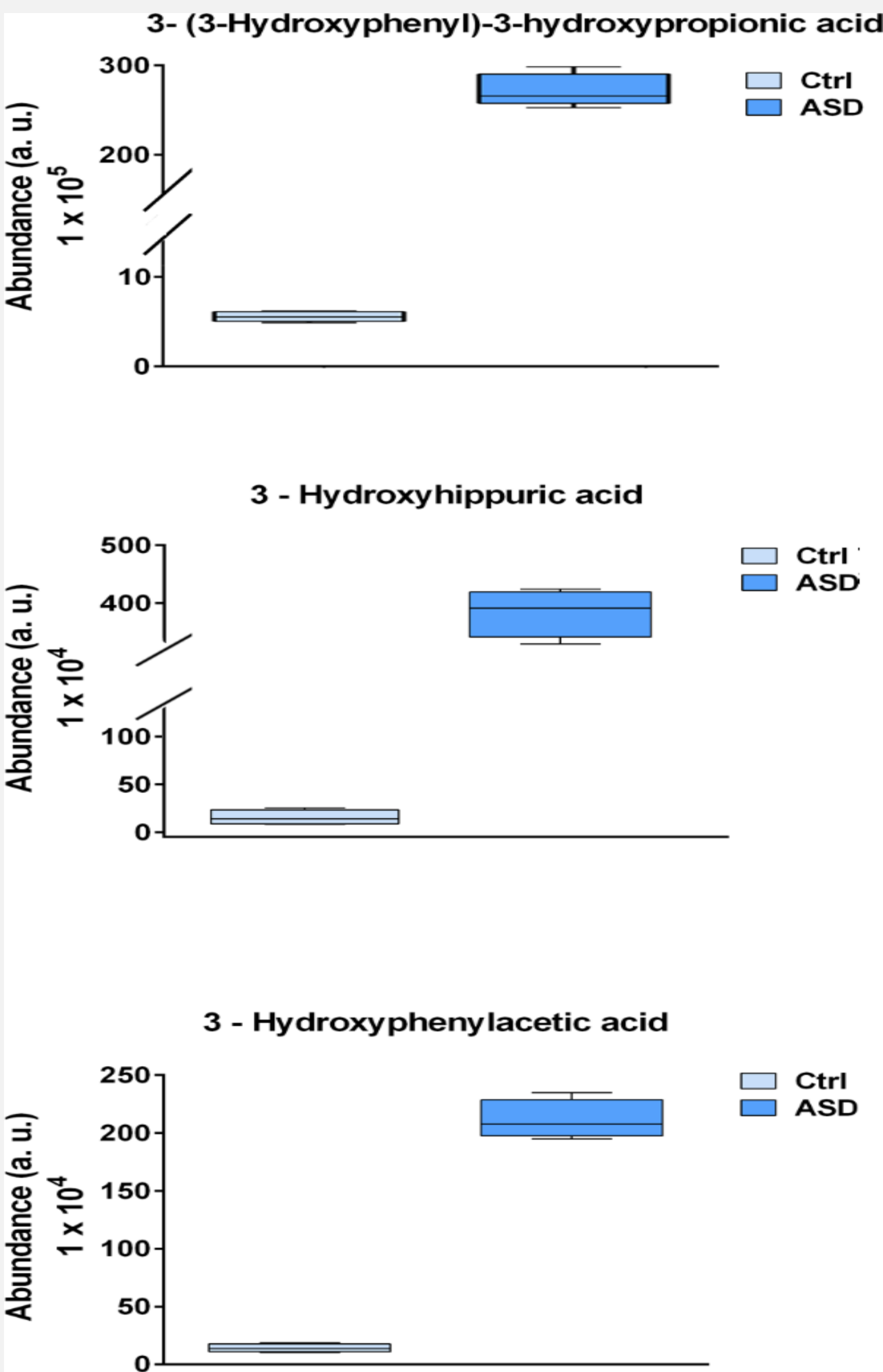


Fig 3: 3-hydroxyphenyl-3-hydroxypropionic acid, 3-hydroxyhippuric acid and 3-hydroxyphenylacetic acid in ASD subjects and in control subjects $p < 0.05$

BIBLIOGRAFIA

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