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BIOAVAILABILITY OF HYDROXYTYROSOL IN HYDROXYTYROSOL-ENRICHED BISCUITS IN HEALTHY HUMANS

RAQUEL MATEOS¹, SARA MARTÍNEZ-LÓPEZ¹, GEMA BAEZA¹, MIRYAM AMIGO-BENAVENT¹, JOAN PERMANYER², JOSÉ LUIS ESPARTERO³, BEATRIZ SARRIA¹, LAURA BRAVO¹.

¹Institute of Food Science, Technology and Nutrition (ICTAN), Spanish National Research Council (CSIC), Madrid, Spain. ²Department of Nutrition, School of Pharmacy, Universidad de Barcelona, Spain. ³School of Pharmacy, University of Seville, Seville, Spain.

lbravo@ictan.csic.es

The recent health claim approved by EFSA on the capacity of olive oil polyphenols, namely hydroxytyrosol (HT) and its derivatives, to protect low-density lipoprotein (LDL) against oxidative stress has attracted the interest of the food industry in the usage of HT as a bioactive food ingredient. Although olive oil polyphenols are highly bioavailable and extensively recovered in urine, the food matrix could play a crucial role modifying their bioavailability. The aim of this study was to evaluate the bioavailability of HT in a healthy population after consuming HT-enriched biscuits (B-HT) in comparison with control biscuits (B-C).

A crossover, randomized, controlled, double-blind study was carried in men and women (n=13), aged 22-37, non-smoker, non-vegetarian with BMI 20-30 kg/m². On two different days separated by a two-week washout period, after an overnight fast, volunteers consumed 30 g of either B-C or B-HT (containing 5.25 mg of HT). Blood samples were collected at baseline and 0.5, 1, 2, 3, 4, 5 and 6 hours after the intake. Urine samples were collected before intake (t=-2-0h) and at intervals 0-3, 3-6, 6-12 and 12-24 h after consuming the biscuits. Liquid-liquid extraction and protein precipitation with acetonitrile was used to isolate HT metabolites from plasma. Urine samples were diluted with MilliQ water, centrifuged and filtered. Plasma and urine samples were analysed by LC-QToF. Serum antioxidant capacity was determined by FRAP, ABTS and ORAC assays, and plasma oxidised-LDL (oxLDL) was assessed by ELISA.

HT was extensively absorbed, reaching 2 µM in plasma between 0.5-1 h after the intake of B-HT. HT was rapidly excreted in urine, recovering 75% of the amount ingested of which approximately 70% was eliminated in the first three hours after the intake. HT and 3,4-dihydroxyphenylacetic acid (DOPAC) sulphated derivatives were the main metabolites found in plasma and urine samples, followed by DOPAC and homovanillic acid (HVA), and glucuronide derivatives. Basal levels of DOPAC and HVA, along with their conjugate metabolites, were detected in urine and HVA in plasma, since they are involved in the metabolism of catecholamines. These metabolites, which were detected along 24 h, showed significantly higher levels after B-HT intake in comparison with B-C, showing the contribution of HT metabolism to their presence in biological fluids. No differences were observed between the two biscuits in the postprandial reducing power and radical scavenging activity; in contrast, oxLDL concentration significantly decreased after B-HT intake in comparison with B-C.

It can be concluded that HT, as a functional ingredient in biscuits, is highly bioavailable, being extensively metabolized and rapidly recovered in urine, although maintaining its biological action reducing postprandial oxLDL levels.

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