Impact of a cocoa-based diet rich in polyphenols on cognitive function, emotional behavior, and adult hippocampal neurogenesis in mice

Sonia Melgar-Locatelli[1,2], M.C. Mañas-Padilla[1,2], A. Castro-Zavala[1,2], M. C. Razola – Díaz[4,5], M. Palma-Morales[4,5], P. Rivera-González[1,3], C. Rodríguez-Pérez[4,5,6], E. Castilla-Ortega[1,2]

1. Instituto de Investigación Biomédica de Málaga-IBIMA, Málaga, Spain
2. Departamento de Psicobiología y Metodología de las Ciencias del Comportamiento, Universidad de Málaga, Málaga, Spain
3. Unidad de Gestión Clínica de Salud Mental, Hospital Regional Universitario de Málaga, Málaga, Spain
4. Departamento de Nutrición y Bromatología, Universidad de Granada, Campus de Cartuja, Granada, Spain
5. Instituto de Nutrición y Tecnología de los Alimentos 'José Mataix', Universidad de Granada, Granada, Spain
6. Instituto de Investigación Biosanitaria de Granada (ibs.GRANADA), Granada, Spain

Cocoa consumption has long been associated with numerous health benefits due to its rich composition of minerals, fiber, methylxanthines, and polyphenols, particularly flavanols. However, the cognitive effects of cocoa have been scarcely investigated. To further explore the impact of cocoa on cognitive function and emotional behavior, a study was conducted using young adult male and female C57BL/6J mice. The mice were fed a standard diet, a high-polyphenol content cocoa (HPC) diet, or a low-polyphenol content cocoa (LPC) diet for four weeks. A battery of behavioral tests was performed to assess exploratory and emotional behavior and hippocampal-dependent memory. Additionally, adult hippocampal neurogenesis was also evaluated. The results indicated that cocoa-enriched diets did not have a substantial impact on general exploratory activity or anxiety-like behavior. However, the LPC diet led to decreased locomotor activity. The HPC diet improved object recognition memory, while all groups performed similarly in the place memory test. In the forced swimming test, both cocoa-enriched diets increased immobility behavior. Cocoa did not affect spatial memory in the water maze. Moreover, the HPC diet enhanced adult hippocampal neurogenesis. Sex differences did not significantly influence the observed effects. In conclusion, cocoa-enriched diets, particularly the HPC diet, have the potential to improve object memory and promote adult hippocampal neurogenesis in mice. The specific differences observed between the HPC and LPC diets are likely attributed to differing polyphenol compositions. These findings contribute to our understanding of the potential cognitive and neurogenic benefits associated with cocoa consumption. Project PID2020-114374RB-I00 funded by MCIN/AEI/10.13039/501100011033/ and Junta de Andalucía-Consejería de Universidad, Investigación e Innovación—Proyect P21_00777. University of Malaga. University of Malaga.