Protective antioxidant effects of Polyphenols extracted from the French medicinal plant Antirhea Borbonica on cerebral endothelial cells exposed to Diabetes-related Hyperglycemia

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Abstract

Type-2 diabetes promotes vascular complications, leading to neurological disorders such as stroke. Indeed, hyperglycaemia alters the blood-brain barrier integrity by deregulating the cerebral endothelial cell function. Oxidative stress may play a causal role. Thus, the biological effect of plant polyphenols known to exert antioxidant capacities is of high interest. We evaluated the effect of polyphenols from the medicinal plant *Antirhea Bourbonic* referred in the French Pharmacopeia for antidiabetic properties, on the production of redox and vasoactive markers from cerebral endothelial cells exposed to hyperglycaemia. Polyphenols extracted from *Antirhea Bourbonic* were identified by UPLC-MS method. Then, their action on murine bEnd.3 cerebral endothelial cells exposed to hyperglycaemia was determined by measuring the intracellular levels of free radicals (DCFH-DA assay), SOD activities (enzymatic assay) and the production of redox and vasoactive molecules (RT-qPCR, DAF-FM assay). We found that *Antirhea Bourbonic* exhibited a high content (4%, w/w) of polyphenols including caffeic acid, chlorogenic acid, kaempferol and quercetin. Plant polyphenols decreased hyperglycaemia-induced production of free radicals and NADPH oxidase 4 gene expression. Moreover, plant polyphenols counteracted the deregulation of Cu/ZnSOD activity and Nrf2 redox transcriptional factor gene expression mediated by hyperglycemia. Preconditioning of cells with specific inhibitors targeting the signaling molecules JNK, ERK, PI3K and NFκB modulated hyperglycemia-induced oxidative stress and showed their possible involvement in polyphenol action. Polyphenols also abrogated hyperglycemia-mediated down-regulation of the intracellular levels of NO vasodilatator. Interestingly, caffeic and chlorogenic acids detected among the major polyphenols of *Antirhea Bourbonic* exerted similar protective effects. Collectively, these findings demonstrated that polyphenols extracted from *Antirhea Bourbonic* protected cerebral endothelial cells against hyperglycemia-mediated oxidative stress. Further studies are in progress to evaluate the in vivo benefits of plant polyphenols on a mouse model exposed to hyperglycemia and middle cerebral artery occlusion to mimic a cerebral ischemia during type-2 diabetes.

Biography

Angelique Arcambal is perusing her PhD from University of Reunion, France, under the supervision of Professor Marie-Paule Gonthier. Marie-Paule Gonthier is a Professor of Nutrition at the Medicine School of the University of Reunion in France. She has received her PhD degree in Nutrition from the Medicine School of Clermont-Ferrand, France.

Her work consisted on evaluating the bioavailability of dietary antioxidant polyphenols in humans and demonstrated the role of the gut microflora on polyphenol metabolic fate. During her Post-Doctoral position at the National Research Center of Naples, Italy, she contributed to the understanding of the effects of endocannabinoids derived from dietary lipids on adipose tissue biology and reported the overproduction of endocannabinoids from human adipocytes and pancreatic beta cells during obesity and type-2 diabetes.

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