

How plant food bioactives may have benefits for vascular health? The case of curcumin.

Laurent-Emmanuel Monfoulet^a, Dilek Coban^a, Sylvie Mercier^a, Dominique Bayle^a, Nicolas Barber-Chamoux^{a,c}, Dragan Milenkovic^a, Christine Morand^a,

^a Université Clermont Auvergne, INRA, UNH, CRNH Auvergne, F-63000 Clermont-Ferrand, France

^b Research and Development Department, National Institute for Research and Development for Cryogenic and Isotopic

^c CHU Clermont-Ferrand, Service de Cardiologie, F-63000 Clermont-Ferrand, France.

Diet is recognized as an important determinant of health. During the last decade, the protective effect of fruits and vegetables on cardiovascular health has been correlated to the high content of these foods in bioactive compounds, especially polyphenols. The interest of these compounds for cardiovascular health is also supported by clinical studies reporting beneficial effects of polyphenol-rich fruit consumption on intermediate markers of cardiovascular diseases. In addition, animal and in vitro studies provided a number of results accounting for a positive role of polyphenols to prevent some dysfunctions associated to the development of cardiovascular diseases. Among these bioactives is curcumin. We previously showed that curcumin reduced the infiltration of immune cells into the vascular wall and prevented atherosclerosis development in mice. This study aimed to decipher the underlying mechanisms of these actions investigating the effect of curcumin on endothelial cell function.

Human umbilical vein endothelial cells (HUVECs) were exposed to curcumin (0.5-1 μM) for 3 hours prior to their activation by Tumor Necrosis Factor alpha (TNF- α). Endothelial permeability, monocyte adhesion and transendothelial migration assays were conducted under static condition and shear stress that mimics blood flow. We further investigated the impact of curcumin on signaling pathways and on the expression of genes using macroarrays.

Pre-exposure of endothelial cells to curcumin reduced monocyte adhesion and their transendothelial migration in both static and shear stress conditions. Curcumin also prevented changes in both endothelial permeability and the area of HUVECs when induced by TNF- α . We showed that curcumin modulated the expression of 15 genes involved in the control of cytoskeleton and endothelial junction dynamic. Our findings demonstrate the ability of curcumin to reduce monocyte TEM through a multimodal regulation of the endothelial cell dynamics with a potential benefit on the vascular endothelial function barrier.

