CLA and CLNA ameliorate neuroinflammation and cellular oxidation related with western diets

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High-fat diet has been associated with a chronic-low grade inflammation in both adipose tissue and central nervous system. Fatty acids are known to cross the blood-brain barrier and reach the central nervous system where they can accumulate. Microglia express a wide range of lipid-sensitive receptors, potentially triggering inflammatory responses. Since fatty acids can exert pro and anti-inflammatory effects in the hypothalamus, in this work, through live cell imaging and FRET technology, we assessed the potential role of omega-3 fatty acids and CFAs in modulating microglia inflammation triggered by obesogenic nutrients. First, the combined action of fructose and saturated fatty acid palmitic acid (to mimic western pattern diet), induced NFkB pathway activation and oxidative stress, by reactive oxygen species production, in HMC3 human microglia. Such results suggest that western pattern diet may induce microglia inflammatory processes in the central nervous system, ultimately resulting in neuroinflammation. On the other hand, exposure of HMC3 cells to polyunsaturated fatty acids (omega-3 – EPA and DHA- and CLA and CLNA isomers) showed a preventive potential, since they were able to abolish the palmitic acid+fructose induced-NFkB pathway activation. Moreover, omega-3 and CLA also showed antioxidant potential by inhibition of reactive oxygen species production. Although the mechanisms of action have not been fully described yet, GPR120/FFA4 is known to bind some omega-3 fatty acids. By using chemical agonists and antagonists of GPR120/FFA4 it was demonstrated that while omega-3, CLA and CLNA effect on NFkB pathway inhibition is mediated by this receptor, the antioxidant ability of omega-3 and CLA occurs through different signaling mechanisms. It was suggested, for the first time, that CLA and CLNA have a similar action to omega-3 on microglia, probably via GPR120 activation and modulation of NFkB-associated inflammatory pathways.