Drug addiction: new targets for an old problem

Teresa Summavielle[1,2,3]

[1]I3S- Instituto de Investigação e Inovação em Saúde, Universidade do Porto, Porto, Portugal
[2]IBMC- Instituto de Biologia Molecular e Celular, Universidade do Porto, Porto, Portugal
[3]School of Allied Health Technologies, Polytechnic Institute of Porto, Vila Nova de Gaia, Portugal

Classically, exposure to psychotropic stimulants has been primarily associated with damage to dopaminergic neuronal terminals and oxidative stress. However, it is now widely accepted that the interaction between neuronal and glial cells plays a critical role in the development of drug addiction. In this sense, exposure to psychostimulants has been repeatedly shown to produce inflammation in the addicted brain. The existing data evidences that the overall contribution of inflammation to the build up of addiction remains unclear. Contrary to the common held view, our data revealed that methamphetamine (METH), a potent psychostimulant frequently associated to neuroinflammation, cannot stimulate microglia in a cell-autonomous manner. In addition, recent findings evidenced microglia as a multifunctional cell, critical for shaping and refining neuronal connectivity through synaptic plasticity. We hypothesised that the long-term adverse neuropsychiatric consequences occurring within the brain's reward circuitry under psychostimulat exposure may be due, at least in part, to the underlying neuroinflammatory process, and that limiting it would be relevant to control the addictive behaviour. We show that preventing exacerbated microglial activation and associated neurotoxicity is beneficial at several levels, and that this knowledge can be easily translated into clinical applications.