Multiplexed detection of epigenetic markers using Quantum Dot (QD)-encoded hydrogel microparticles

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Epigenetic alterations in gene expression are influenced by experiences and environment, resulting in significant variation of epigenetic markers from individual to individual. Therefore, it is imperative to measure various epigenetic markers simultaneously from samples of individual subjects to accurately analyze the epigenetic markers. We report multiplexed detection of genome-wide changes in various histone modifications using QD-encoded PEGDA hydrogel microparticles. We present the simultaneous detection of 1) acetylation of lysine 9 of histone 3 (Ac-H3K9), 2) di-methylation of H3K9 (2Me-H3K9), and 3) tri-methylation of H3K9 (3Me-H3K9) from three distinct regions in the brain (nucleus accumbens, dorsal striatum, and cerebellum) of cocaine-exposed mice. Our hydrogel-based epigenetic assay enabled relative quantification of the three histone variants from only 10 μL of each brain lysate (protein content=~1 μg/μL) per mouse. We verified that the exposure to cocaine induced a significant increase of acetylation while a notable decrease in methylation in NAc.