Detection of neuroblastoma differentiation using Bi_2Se_3/Ag/RNA three-way junction

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Cell differentiation therapy based on nanoparticle has received great attention as a promising alternative to conventional cancer treatments. In this study, nanoparticle-based biohybrid material can completely differentiate SH-SY5Y cancer cells into neurons and stop its growth in 6 days without any other treatment. Biocompatibility and plasmonic characteristics of the biohybrid material are remarkably expressed because the bismuth selenide nanoparticle (Bi_2Se_3 NP) is covered with silver (Bi_2Se_3/Ag). The RNA three-way junction structure is also designed to allow Bi_2Se_3/Ag to perform four functions. One part of the three-way junction is attached to the Bi_2Se_3/Ag, another part attached to cell-penetrating RNA with a fluorescence tag, and the other part is assigned to inhibit microRNA-17 (miR-17) and release retinoic acid (RA). The slow release of RA through the inhibition of miR-17 allows the differentiation of neurons with little apoptosis. The cell differentiation process is monitored using SERS techniques. The developed biohybrid material can be used to the manufacture of other diagnostic/therapeutic agents.