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Topic: Construction of a FRET- based nanosensor to monitor exosomes

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FINDING

Exosomes contain a plethora of unique disease biomarkers involving cellular homeostasis, infection dissemination, cancer development, and cardiac diseases. Exosomes originating from cancer cells have promising biomarkers for the early detection and assessment of the therapeutic response to cancer. Current approaches are complicated and time-consuming, therefore hampering their clinical applications. Here, we demonstrate the creation of an innovative fluorescence resonance energy transfer (FRET) sensor, named ExoSen (exosome sensor), which can be implemented to determine the concentration of exosomal EGFRs at in vitro as well as in vivo levels. In this study, a sensing element for A549 exosomes, mitogen-inducible gene 6 (MIG6), has been employed between the FRET pair ECFP and Venus. MIG6 binding to ExoSen induced a conformational change that can be monitored by a variation in the FRET ratio. Moreover, the developed sensor, expressed in bacterial, yeast, and HEK-293T cells, demonstrates an increased FRET ratio with the addition of A549 exosomes, which can quantify the A549 exosomes noninvasively. The ExoSen enables rapid detection of A549 exosomes with great sensitivity at a concentration of 3.5 × 109 particles/mL. ExoSen is stable to pH fluctuations and provides a highly accurate, real-time optical readout in cell-based experiments by using confocal microscopy.