

$\frac{1}{\tau} = k_{off} + k_{on} \frac{[MMP]}{[MMP] + K_D}$
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Results and Discussion. Design of the QD-FRET MT1-MMP Nanosensor.

The design of the QD-FRET MT1-MMP nanosensor is based on the principle of Förster resonance energy transfer (FRET). The donor is a CdTe quantum dot (QD) with a diameter of 5 nm, which is excited by a 405 nm laser. The acceptor is a fluorophore (Cy5) that is attached to the C-terminal tail of the MT1-MMP protein. The FRET efficiency (E) is defined as the ratio of the energy transferred to the acceptor to the total energy lost by the donor. The FRET efficiency is dependent on the distance between the donor and acceptor, and the overlap of their emission and absorption spectra.

The nanosensor is designed to be inactive in the presence of low levels of MMP activity. Upon binding to the substrate, the MMP cleaves the nanosensor, bringing the donor and acceptor into close proximity. This results in a significant increase in FRET efficiency, which is detected as a change in the fluorescence intensity of the donor.

The nanosensor is composed of a CdTe QD (5 nm diameter) and a Cy5 fluorophore (10 nm diameter) attached to the C-terminal tail of the MT1-MMP protein. The QD is excited by a 405 nm laser, and the Cy5 fluorophore emits light at 645 nm. The FRET efficiency is dependent on the distance between the donor and acceptor, and the overlap of their emission and absorption spectra.

The nanosensor is designed to be inactive in the presence of low levels of MMP activity. Upon binding to the substrate, the MMP cleaves the nanosensor, bringing the donor and acceptor into close proximity. This results in a significant increase in FRET efficiency, which is detected as a change in the fluorescence intensity of the donor.

In Vitro MT1-MMP Proteolysis Yields Rapid Nanosensor Response.

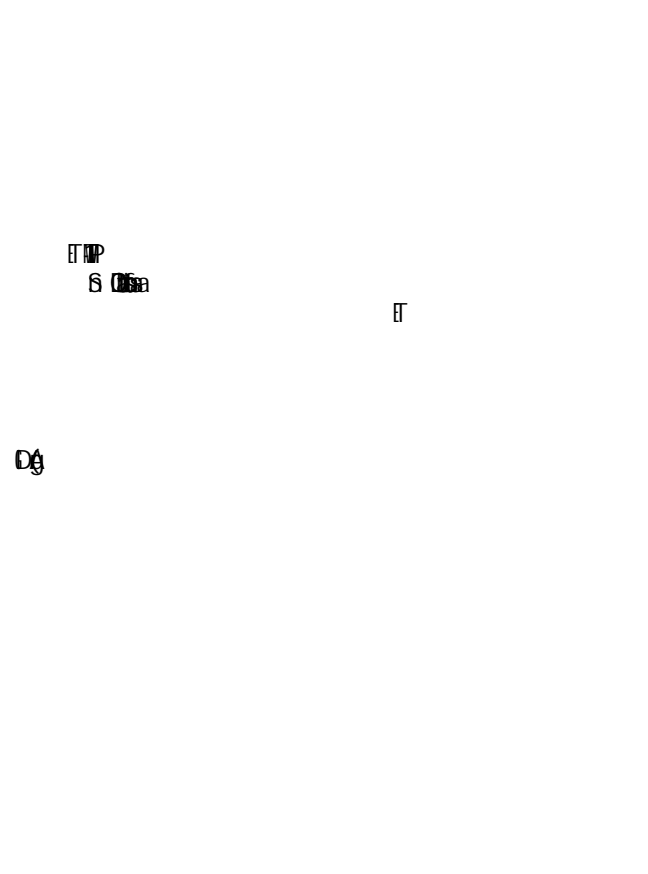
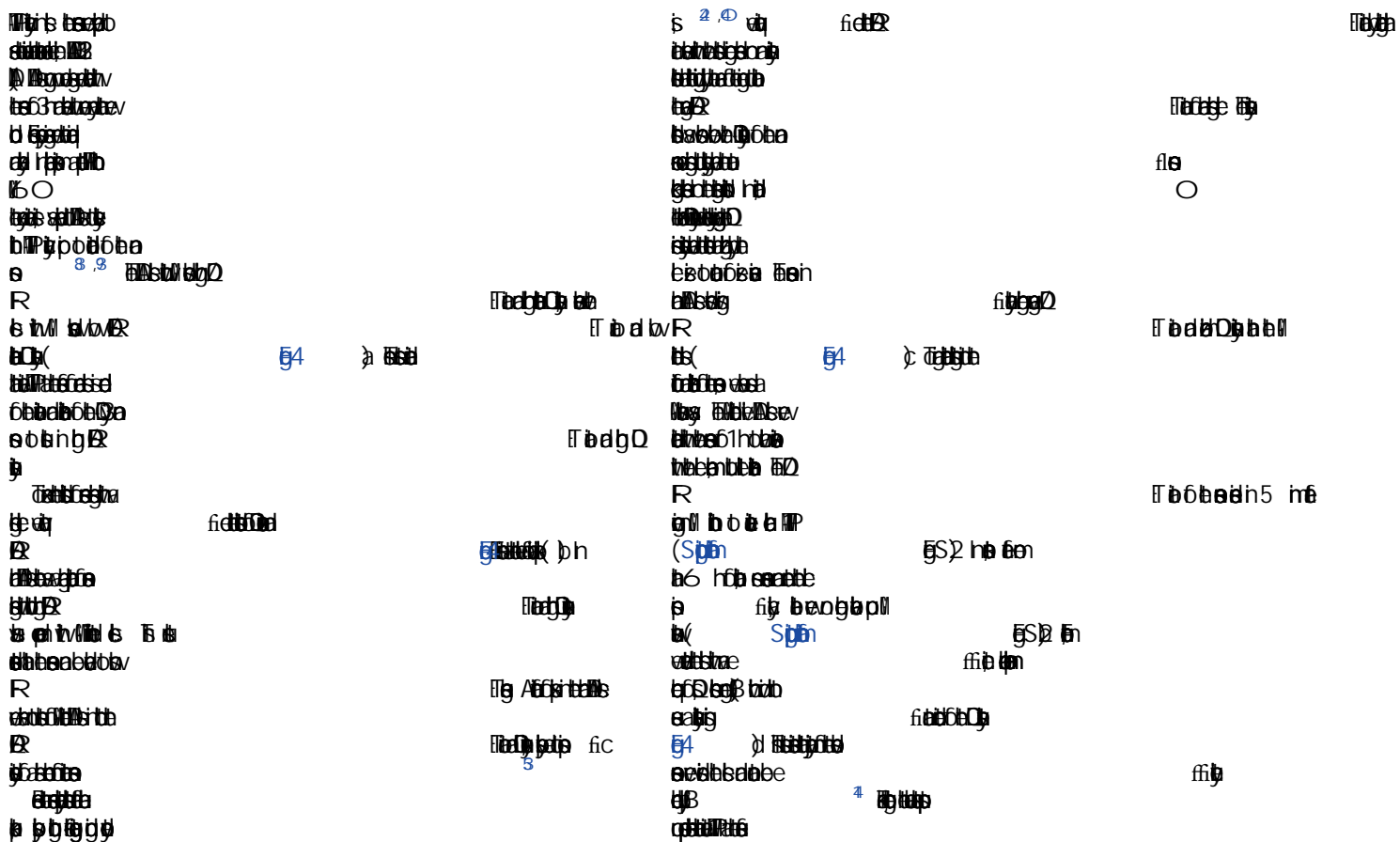


Figure 3. DR



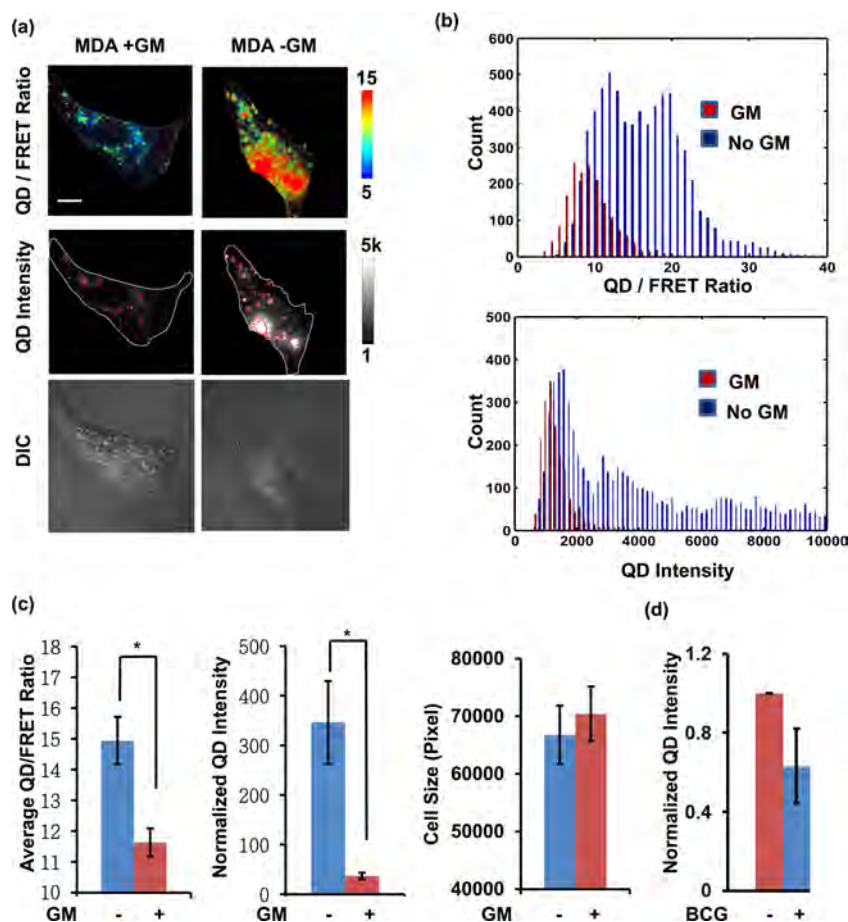


Figure 4. **(a)** Fluorescence microscopy images of cells treated with GM (Galactosylated MDA) or No GM, showing QD/FRET Ratio, QD Intensity, and DIC. **(b)** Histograms showing the distribution of QD/FRET Ratio (top) and QD Intensity (bottom) for GM (red) and No GM (blue) conditions. **(c)** Bar graphs showing Average QD/FRET Ratio (left) and Normalized QD Intensity (right) for GM (-) and GM (+) conditions. **(d)** Bar graphs showing Cell Size (Pixel) (left) and Normalized QD Intensity (right) for BCG (-) and BCG (+) conditions. Asterisks indicate statistical significance.

Classification of Cell Lines through a Dual-Index Readout of QD-FRET Nanosensors.

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Classification of Cell Lines through a Dual-Index Readout of QD-FRET Nanosensors. **(a)** Fluorescence microscopy images of cells treated with GM (Galactosylated MDA) or No GM, showing QD/FRET Ratio, QD Intensity, and DIC. **(b)** Histograms showing the distribution of QD/FRET Ratio (top) and QD Intensity (bottom) for GM (red) and No GM (blue) conditions. **(c)** Bar graphs showing Average QD/FRET Ratio (left) and Normalized QD Intensity (right) for GM (-) and GM (+) conditions. **(d)** Bar graphs showing Cell Size (Pixel) (left) and Normalized QD Intensity (right) for BCG (-) and BCG (+) conditions. Asterisks indicate statistical significance.

Classification of Cell Lines through a Dual-Index Readout of QD-FRET Nanosensors.

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Author Contributions

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