Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Aptamer-recognized carbohydrates on the cell membrane revealed by super-resolution microscopy

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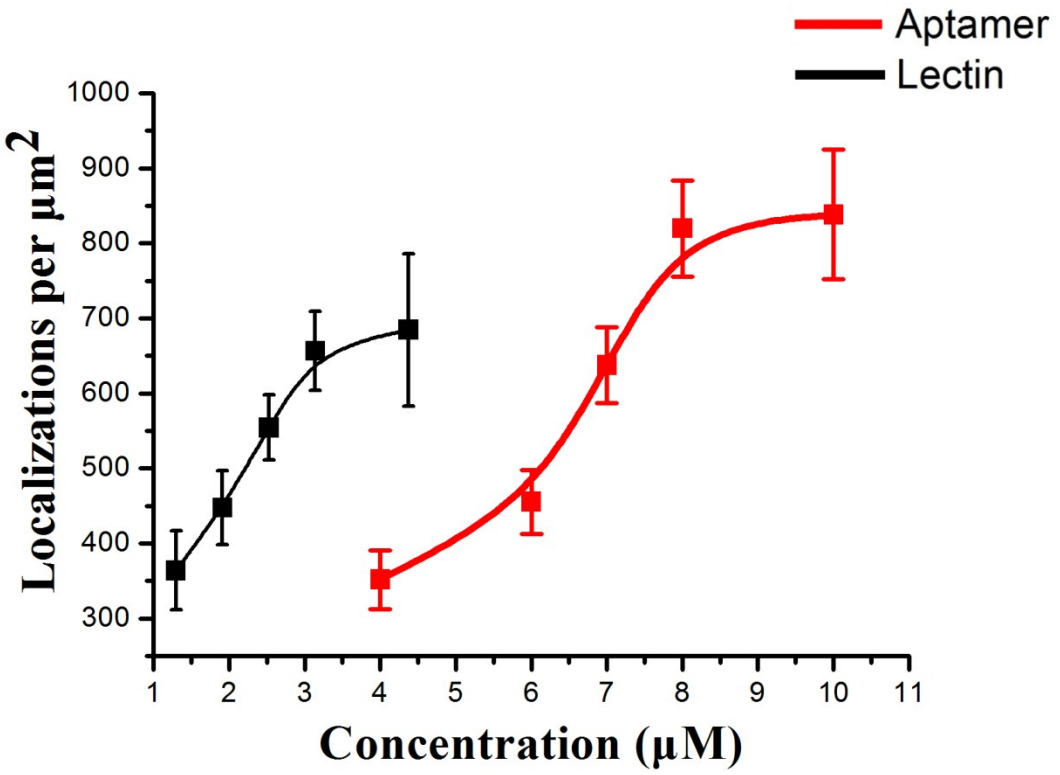

Fig. S1 The saturated concentration curves of aptamers and lectins calculated by localization density. Data shown are means ± standard deviation (s.d.). The statistical results were obtained from ten cells in three independent experiments.

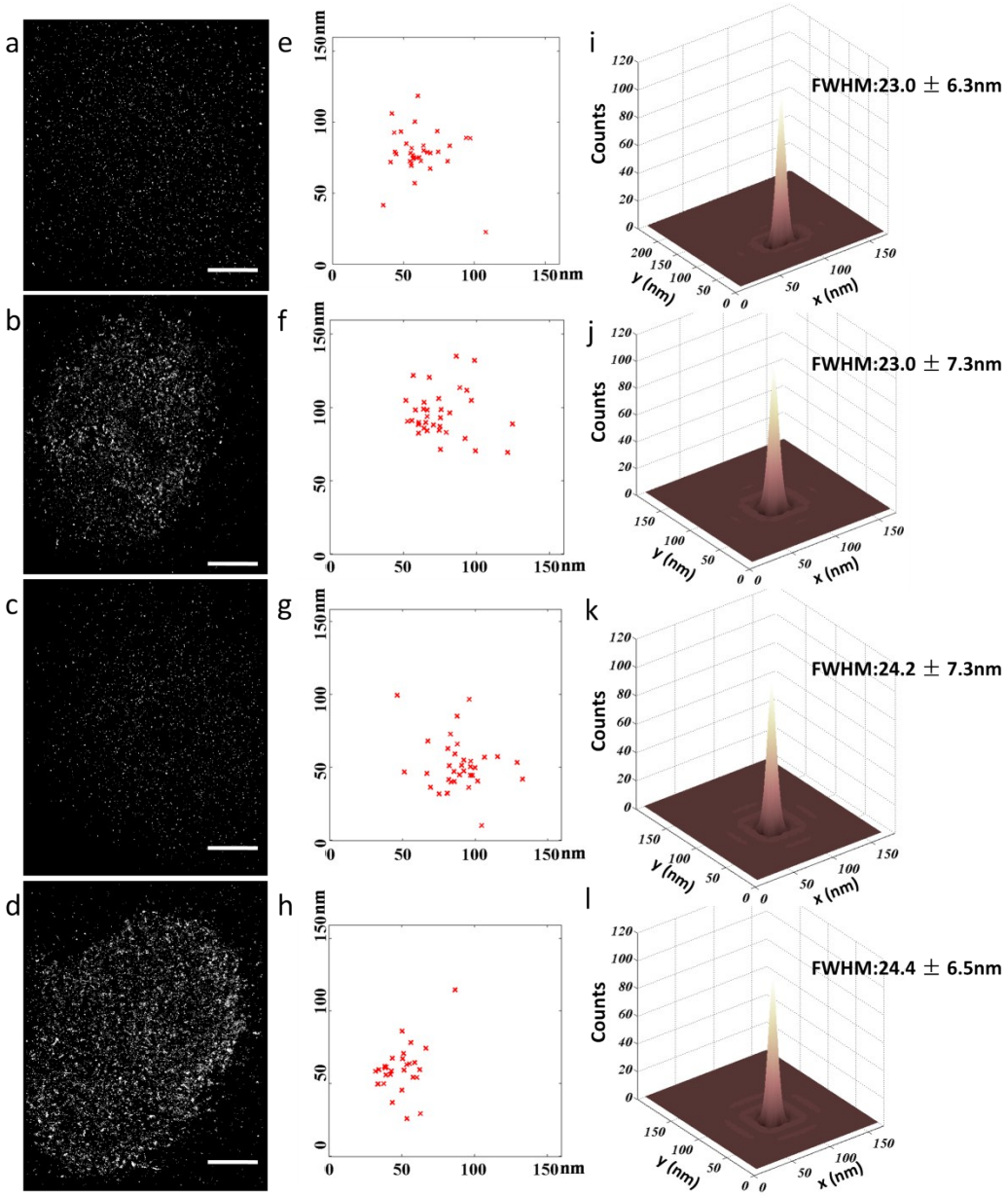

Fig. S2 Measurements of the resolution of TAMRA conjugated aptamers or lectins. (a-d) Representative dSTORM images of TAMRA conjugated aptamers on the empty coverslip (a), on Hela cell membrane (b), and TAMRA conjugated lectins on the empty coverslip (c), on the cell membrane (d). The final concentration of all groups was ~20 nM. Scale bars, 5 μm. (e-h) The distribution of repeated localizations from a single emitter under the four conditions. (i-l) Aligned two-dimensional distribution of localizations from 100 individual fluorescent molecules in 10 independent experiments. The average full-width at half-maximum (FWHM) was calculated which represents the resolution. Data in (i-l) are the means ± standard deviation (s.d.).

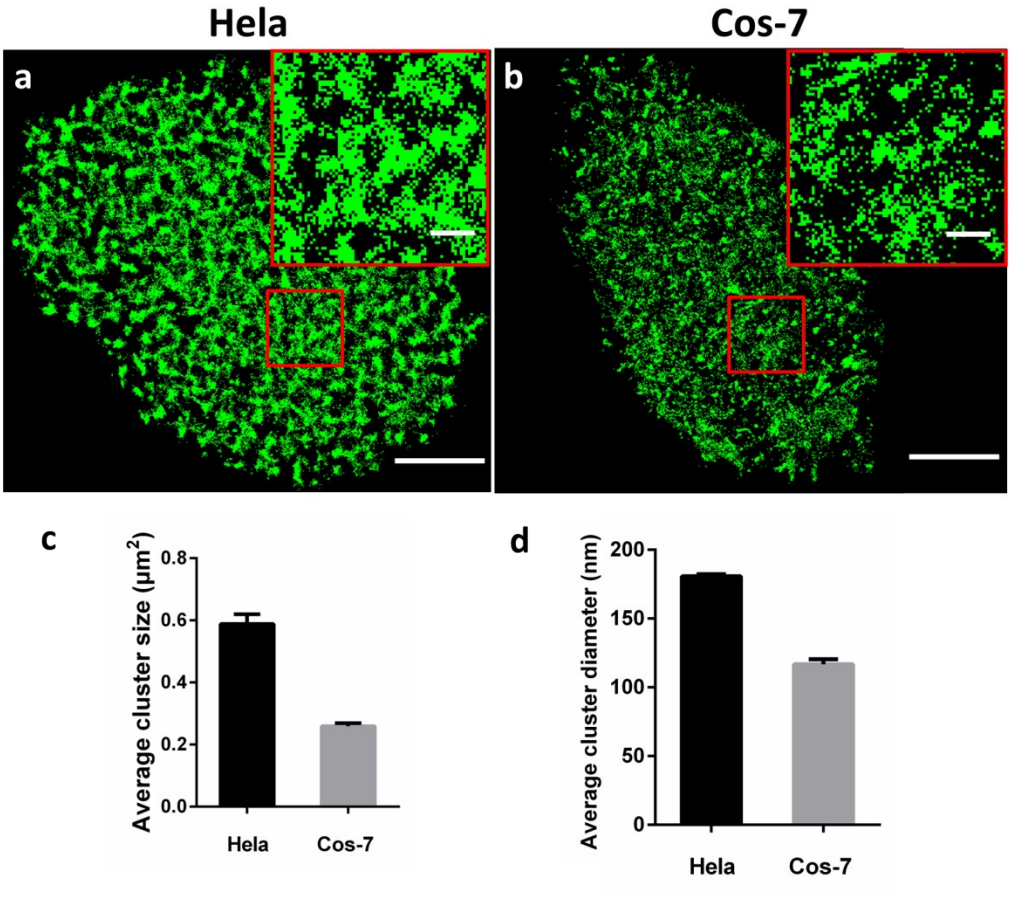

Fig. S3 The distribution of GalNAc on cancer cells and normal cells revealed by dSTORM imaging. (a-b) Reconstructed dSTORM images of GalNAc on Hela (a) and cos-7 (b) cell membranes. Magnified images were shown in the right upper corner, respectively. Scale bars are 5 μm in the original images and 1 μm in the enlarged images. (c) Comparison of the average area of GalNAc clusters on Hela and Cos-7 cell membranes. (d) The average diameter of GalNAc clusters on these two cell lines. Data shown are means ± s.d.. The statistical analysis is obtained from ten cell samples in three independent experiments.

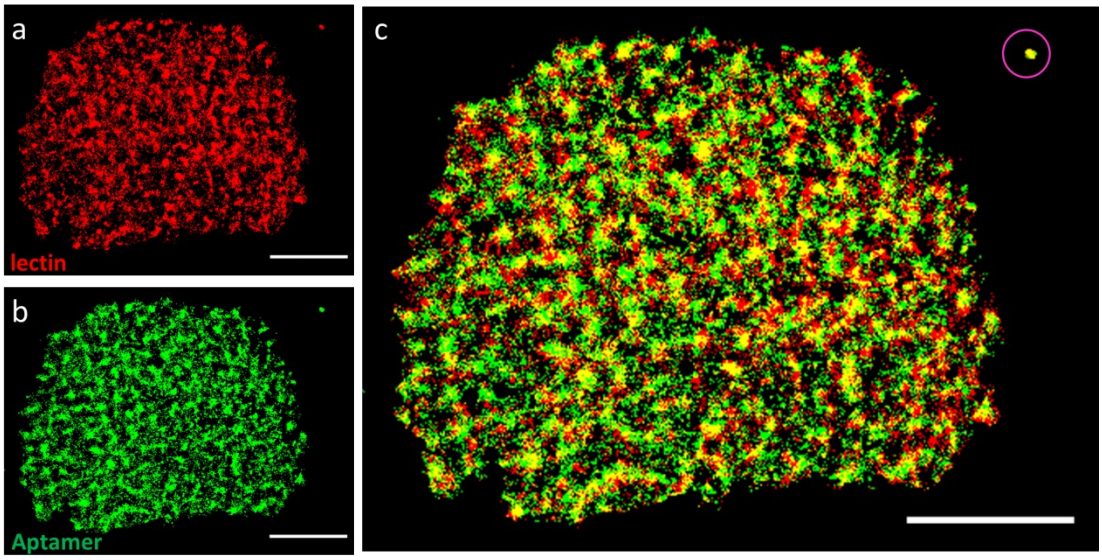

Fig. S4 The recognition specificity of aptamer and lectin analyzed by dual-color dSTORM imaging. Hela cells were labeled with Alexa 647-conjugated lectin (a) and TAMRA-conjugated aptamer at the same time, and then the samples were excited by 640 nm and 532 nm laser successively. Finally, the dSTORM images of GalNAc recognized by lectin (a), aptamer (b) and the merged image (c) were obtained. Microspheres were used as fiducial marker to correct the x–y drift and the optical registration between Alexa 647 and TAMRA channels for dual-color imaging. The microsphere was circled on the right upper corner. The colocalization of lectin and aptamer was measured by the Mander's coefficient test with 0.68 ± 0.11 for lectin and 0.64 ± 0.02 for aptamer. The statistical analysis is acquired from ten cells in three independent experiments. Scale bars are 5 μm.

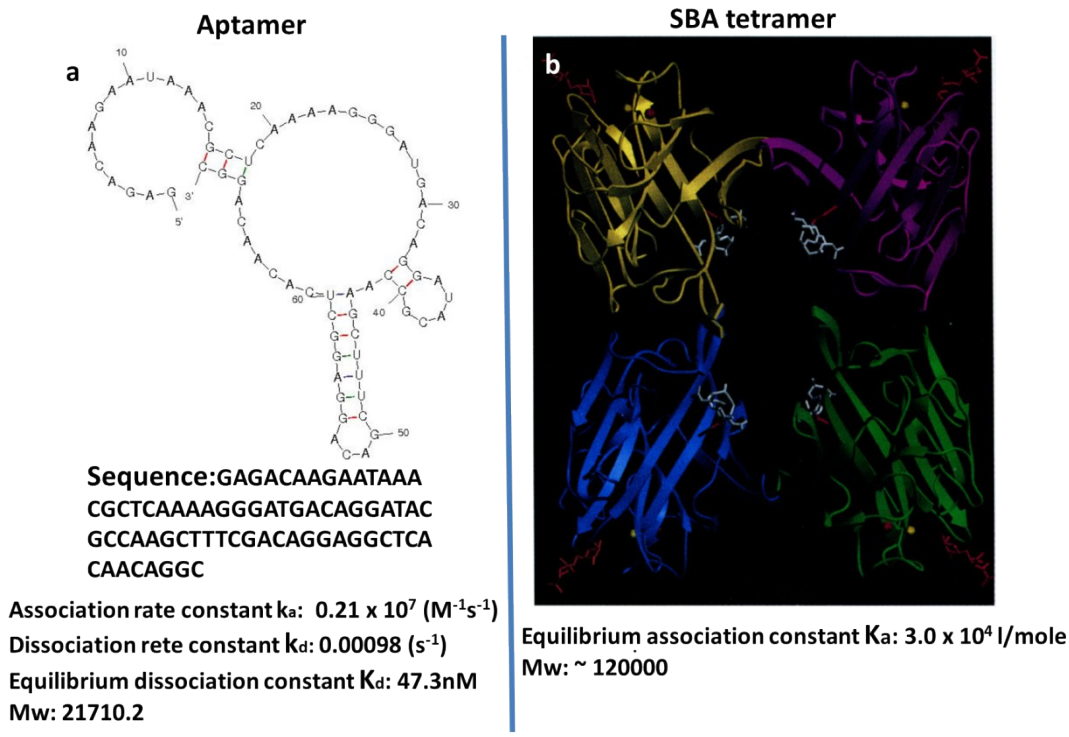

Fig. S5 The detailed information of aptamer and lectin. (a) A predicted DNA secondary structure of aptamer from the website (http://unafold.rna.albany.edu/?q=mfold/RNA-Folding-Form). According to the length of bases, we estimated that the size of the aptamer is about 15 nm. (b) The ribbon diagram of SBA tetramer with the size larger than 30 nm.

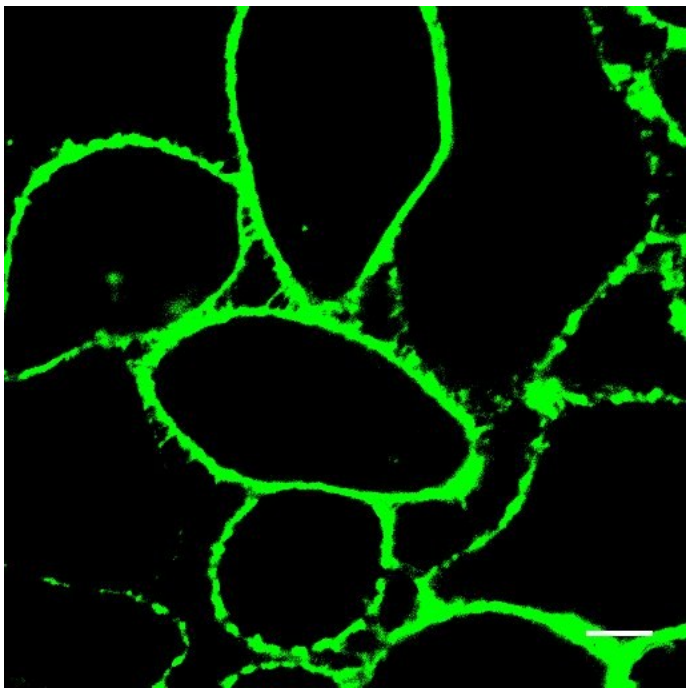

Fig. S6 The confocal fluorescence image of aptamers on Hela cell membrane. The cells were stained with 8 μM aptamers for 10 min at 4 °C. The uptake of aptamers hardly occurred, indicating a proper condition of staining samples for dSTORM imaging. Scale bar, 5 μm.

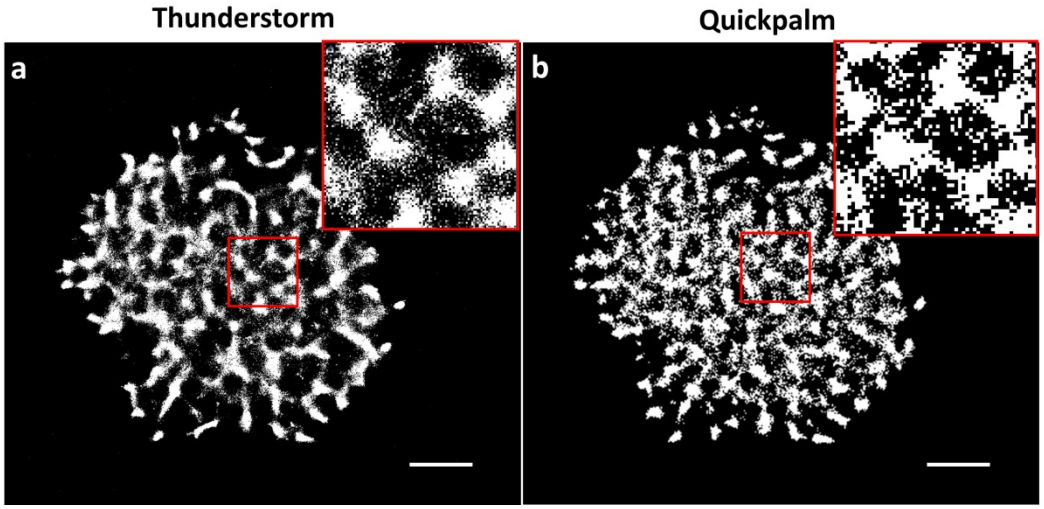

Fig. S7 Reconstructed dSTORM images by thunderstorm (a) and quickpalm (b). The enlarged images were showed in the right upper corner. Scale bars are 5 μm.