Electronic Supplementary Material (ESI) for Lab on a Chip.

Electronic supplementary Information (ESI)

for

DVD technology-based molecular diagnosis platform: quantitative pregnancy test on a disc

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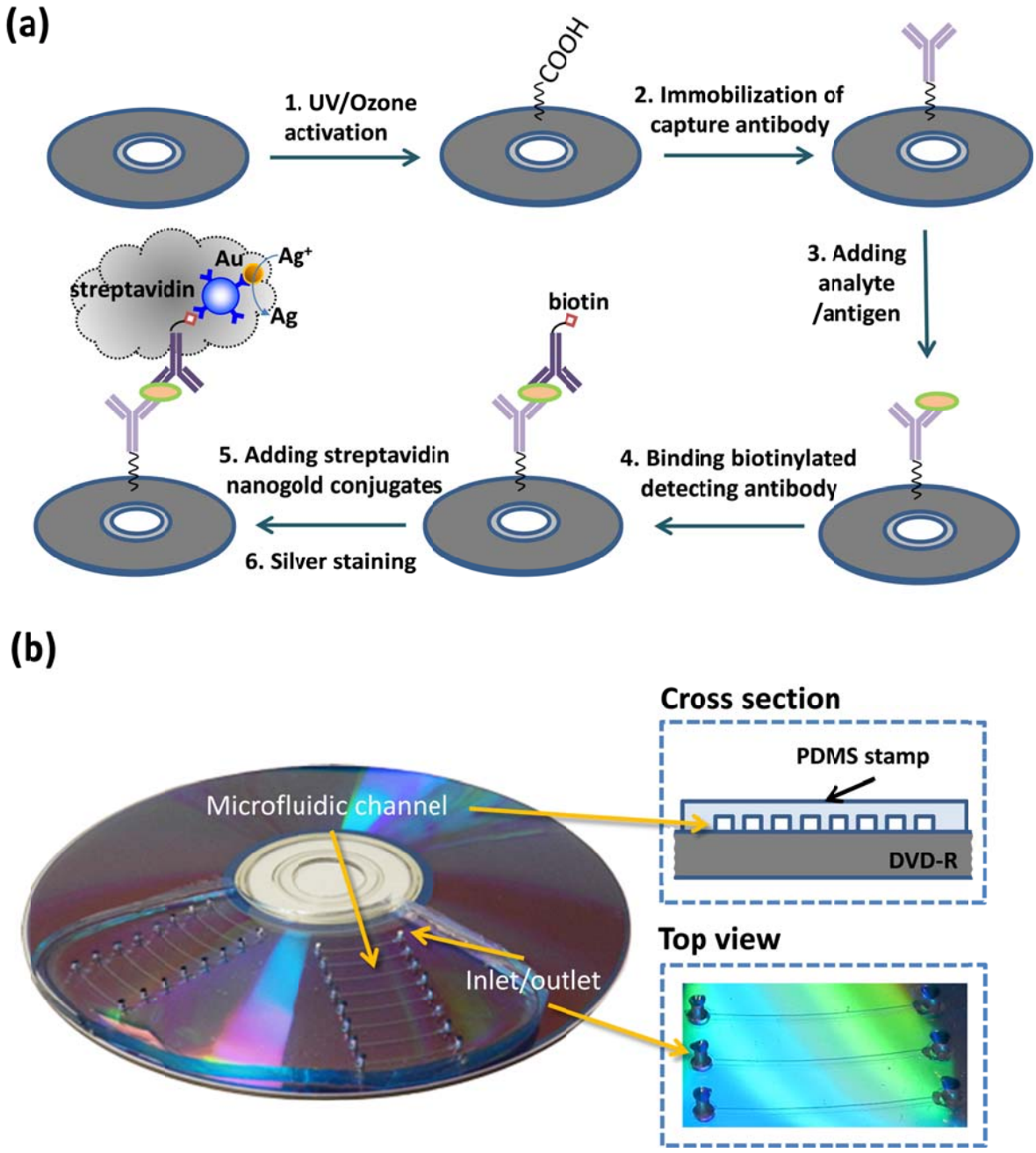

Fig. S1. (a) Step-by-step reactions to prepare a DVDassay: 1. UV/ozone activation to generate carboxylic acid groups on a DVD-R; 2. immobilization of capture antibodies via amide coupling; 3. Binding analytes (antigens) on the surface bound antibodies; (d) binding biotinylated detection antibodies; (e) binding gold nanogold streptavidin conjugates; (f) silver staining for signal enhancement (reduction of Ag^+ to metallic Ag). (b) Microfluidic approach to prepare line arrays of DVDassays. Polydimethylsiloxane (PDMS) plates with embedded microchannels were used to deliver the reactants and washing buffers. The left image shows a PDMS plate attached to a DVD surface and the right pictures show the cross section (schematic) and top view.

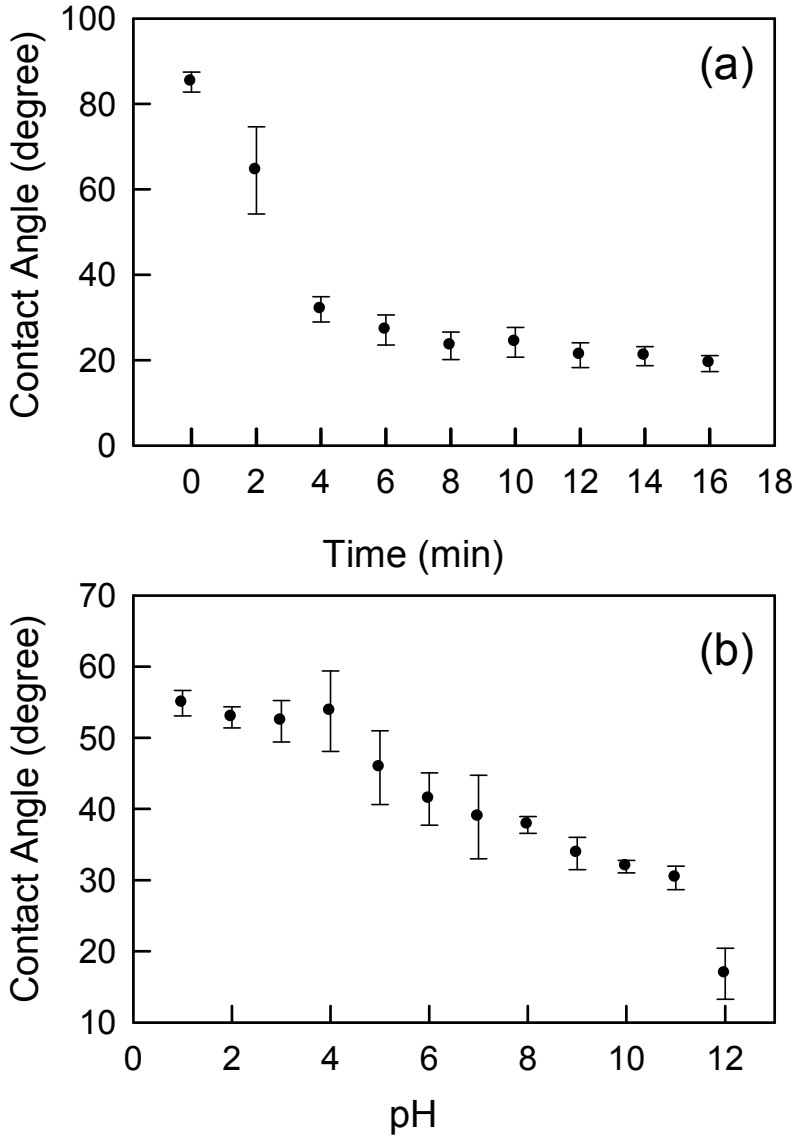

Fig. S2. (a) Dependence of water contact angle on a DVD-R surface as function of the UV/Ozone activation time. (b) Contact angle titration of an activated DVD-R surface (10 min UV/ozone treatment). This confirms the formation of reactive COOH groups besides other polar functionalities (e.g., -OH) that also reduces the surface hydrophobicity.

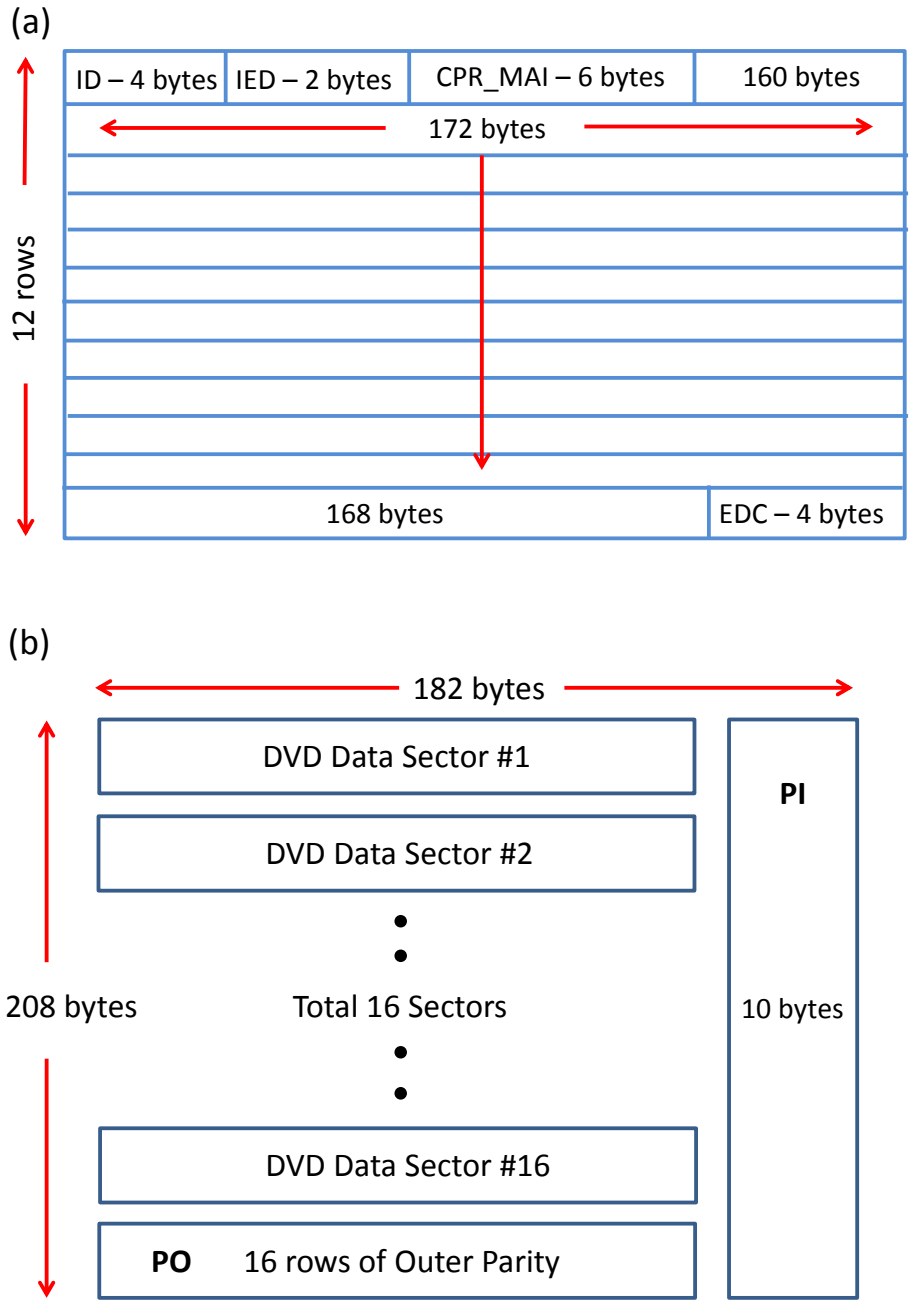

Fig. S3. DVD data structure and error detection algorism. (a) DVD Data sector (2064 bytes, 12 rows × 172 columns of data in total), which is consist of 2048 bytes of user data and 16 bytes of logic and error detection Code. (b) A DVD error correction code (ECC) block, which has a total of 32768 user bytes. It is made up with 16 data sectors (192 rows × 172 columns), with 16 rows of outer parity (PO), and 10 bytes of inner parity (PI) data to each row of the block. Adapted from: DVD Quality, Strategies and Measurements, Optical Disc Technologies, Rev.0.2 3900 Parkview Lane #29B, Irvine, CA 92612.

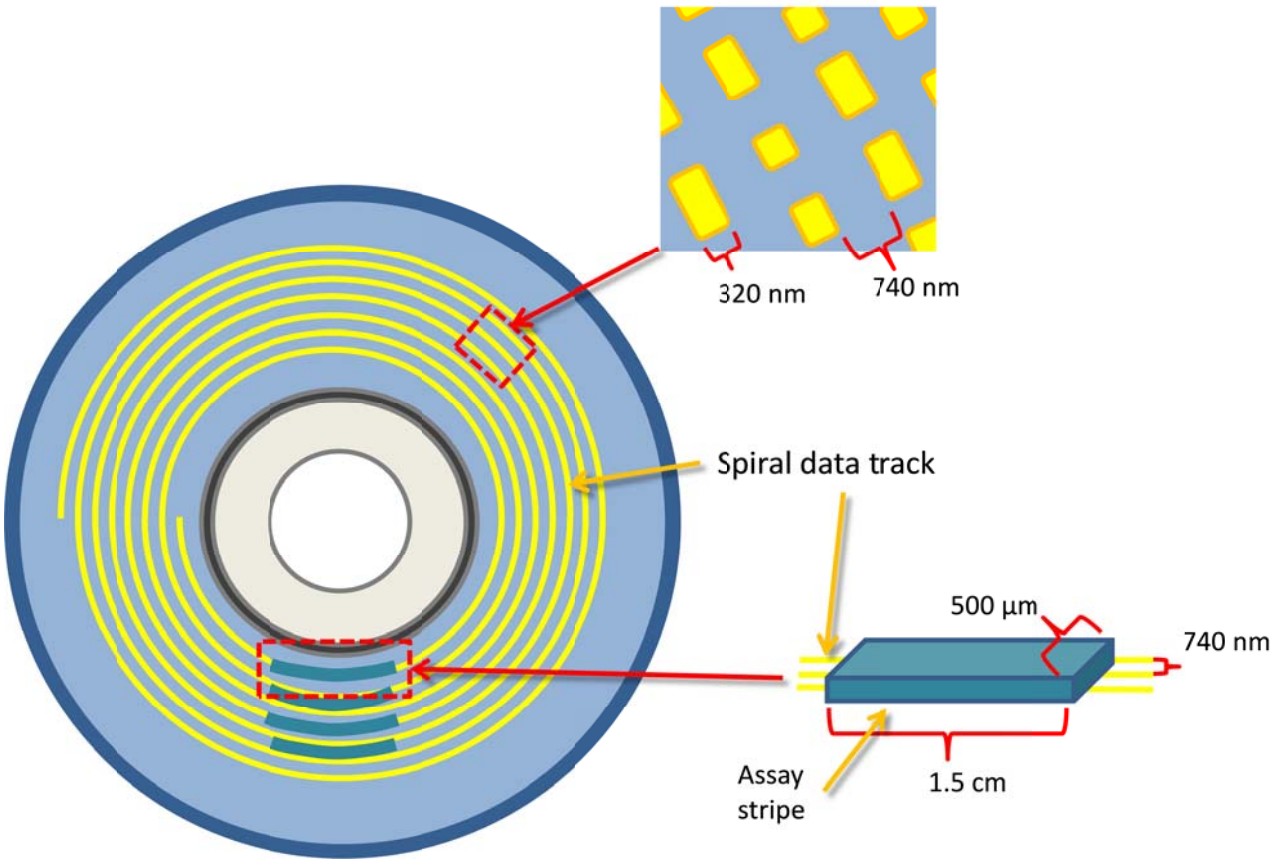

Fig. S4. Schematic illustration of the spiral data track on a DVD. The distance between each track is 740 nm, and the width of the data pit is 320 nm. The width of each assay stripe is 500 µm (determined by the channel width of the PDMS plate), which covers the area of 470 data tracks; because the length of each ECC block is about 7.7 cm along the data track, at least 470 ECC blocks on the DVD for each assay stripe are analyzed for obtaining the PIF counts. Also see, http://www.lightbyte.com/SpiralLength.htm (accessed on Feb. 27, 2014)

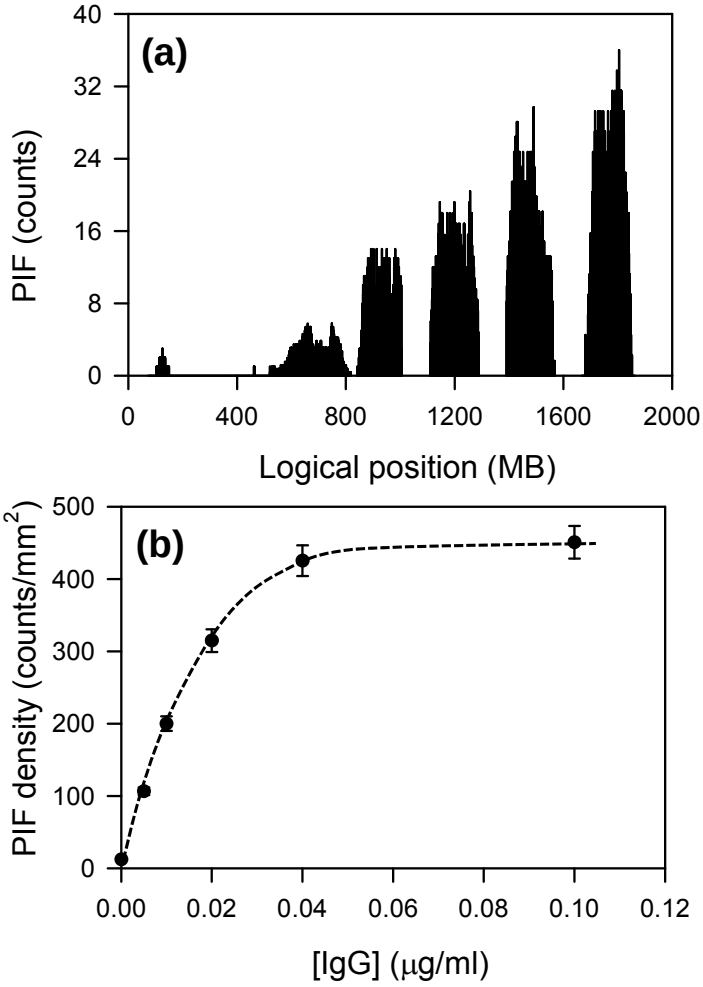

Fig. S5. Quantitation of human IgG/anti-human IgG binding assays on DVD. (a) PIF testing results of the DVD assay; (b) Dependence of the PIF density on the target concentration. The dash line is to guide the eyes only. As the IgG concentration increased from 5 to 50 ng/mL, the signal increased monotonically, and saturated at higher concentrations. By improving the silver staining procedure, we were able to shorten the reaction time to 15 min. Without further optimization (e.g., controlling the surface density of immobilized anti-human IgG and the reaction time), the DVDassay was determined to be more sensitive than the CD assays (response range 25-100 ng/mL, see, Li, Y.; Ou, L.; Yu, H.-Z. *Anal. Chem.* **2008,** *80*, 8216−8223.).

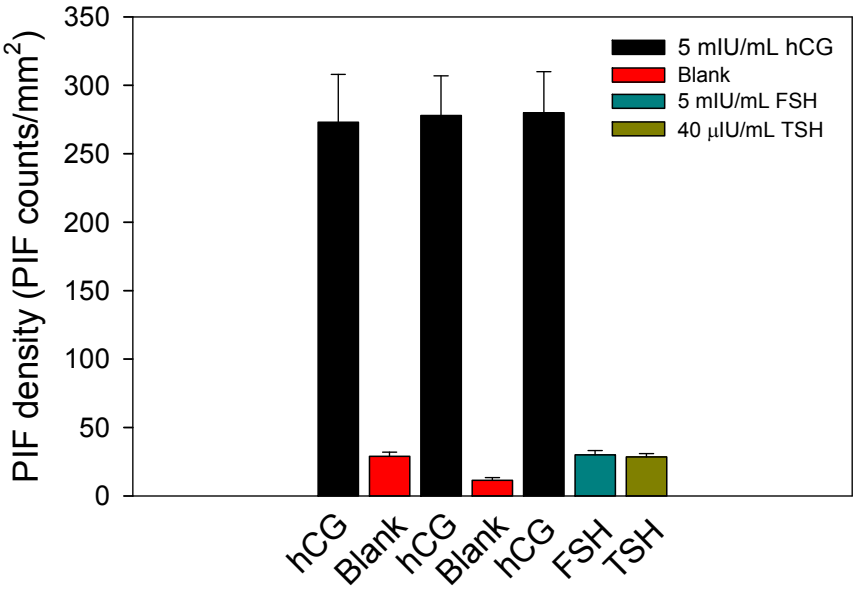

Fig. S6. Specificity of hCG DVDassays; FSH and TSH are for negative controls (5 mIU/mL of FSH and 40 μIU/mL of TSH). The signals for the two negative controls (30±10 counts /mm^2 and 29±10 counts/mm^2) are only slightly higher than the blanks (buffer only). See the main text for details.