Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.
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Supporting information

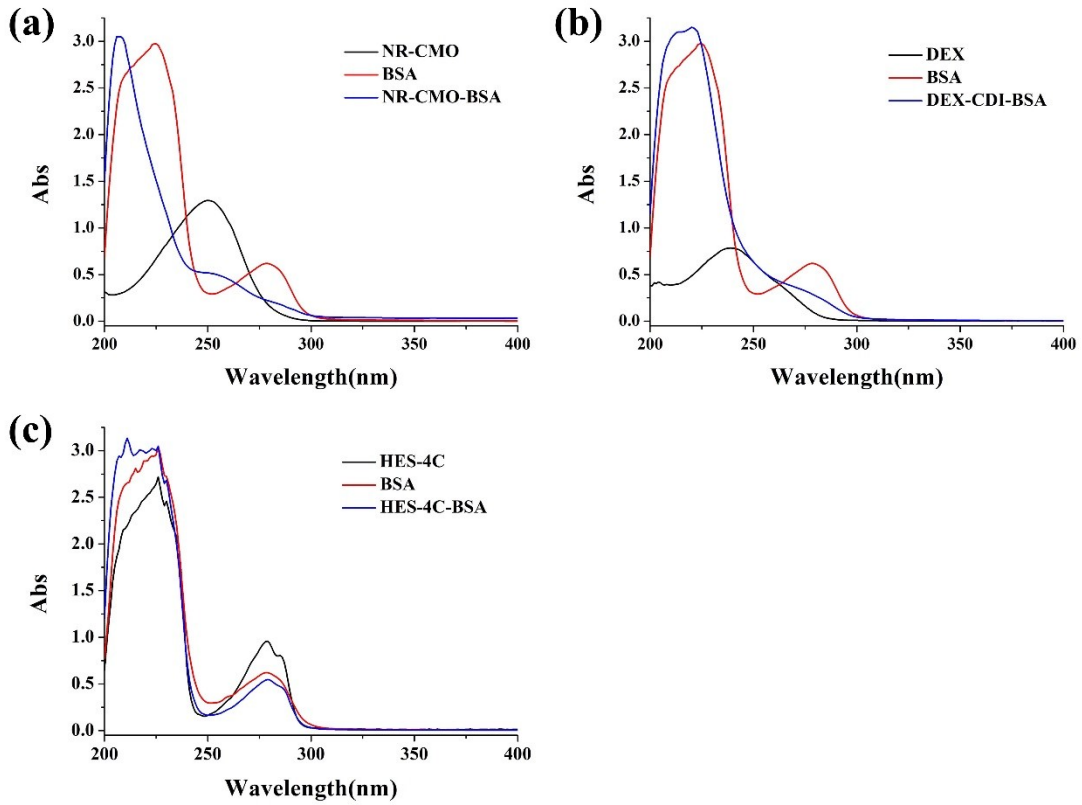
Ultrasensitive detection of seventeen chemicals simultaneously using paper-based sensors

Monoclonal antibody preparation

For preparing the anti-NR mAb, eight female BALB/c mice (6–8 weeks old) were prepared, and then immunized subcutaneously with NR-CMO-BSA. The process are as follows. The first immunizing does consisted of 100μg of antigen as an emulsion of PBS and FCA. Four sequential boosters were administered at 3-week intervals with 50μg of immunogen emulsified in FIA. After each booster, the serum collected form the tail vessel of each mouse were detected for the antibody specificity by ic-ELISA. The mouse with the highest title and the best specificity to DEX was chosen to inject intraperitoneally with 25μg of immunogen dissolved in 100μL normal saline.

Myeloma cells were fused with the spleen cells collected from the BALB/c mouse whose antiserum had the lowest 50% inhibitory concentration (IC_{50}) and the highest titer, using the standard procedure. The supernatant from the hybridoma was detected with an ic-ELISA. We subcloned the positive hybridoma showing the expected inhibition. After three rounds of subcloning with the limiting dilution method, we isolated the target cell strain producing the antibody that best inhibited NR. The strain was expanded, cultured, and injected intraperitoneally into 8–10-week-old BALB/c mice. The antibody was purified from the mouse ascites with the caprylic acid–ammonium sulfate precipitation method and dialyzed against PBS at 4 °C for 3 days.

The anti-DEX mAb and the anti-HES mAb were produced similarly under their individually optimized conditions.



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28 **Fig. S1** The UV spectra of coating antigens. (a) Confirmation of NR-CMO-BSA; (b)

29 Confirmation of DEX-CDI-BSA; (c) Confirmation of HES-4C-BSA.

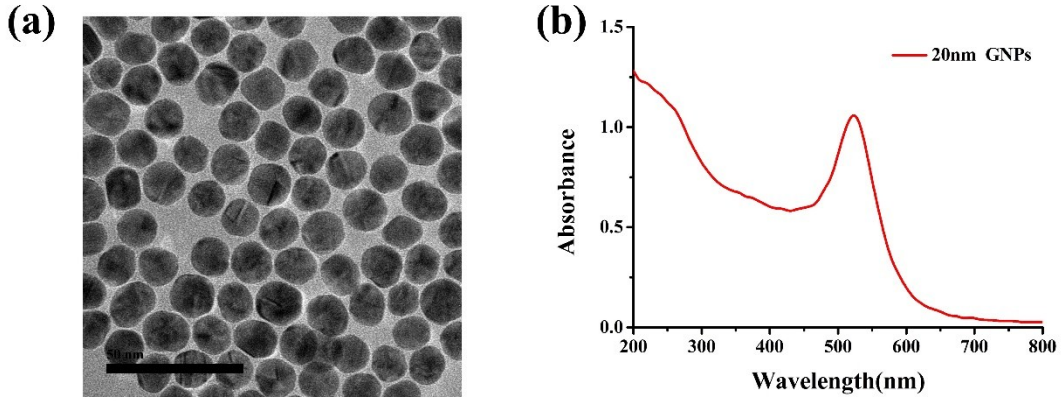

Fig. S2 Characterization of GNPs solution: (a) TEM images; (b) UV-visible spectra, and the maximum absorbance of GNPs solution is 523nm.

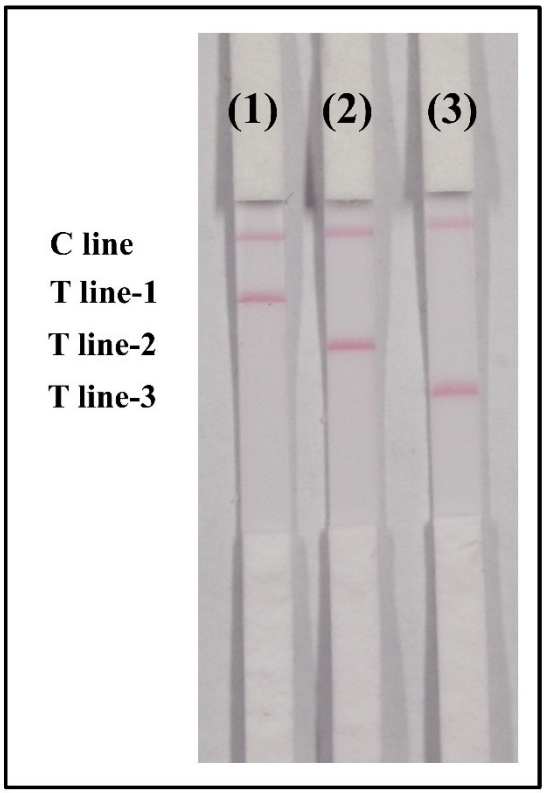

Fig. S3 Specificity of each test line. (1) Only anti-NR mAb-GNP conjugates; (2) Only anti-DEX mAb-GNP conjugates; (3) Only anti-HES mAb-GNP conjugates.

Table S1: The abbreviation and its full name.

Abbreviation	Full name
NR-CMO-BSA	Nandrolone- Carboxymethoxylamine hemihydrochloride- Bovine serum albumin conjugate
DEX-CDI-BSA	Dexamethasone- N,N′-carbonyldiimidazole- Bovine serum albumin conjugate
HES-4C-BSA	Hexestrol-4-bromobutyrate- Bovine serum albumin conjugate
anti-NR-mAb	The monoclonal antibody against Nandrolone and its analogues
anti-DEX-mAb	The monoclonal antibody against Dexamethasone and its analogues
anti-HES-mAb	The monoclonal antibody against Hexestrol and its analogues
GNPs	Colloidal gold nanoparticles
LC-MS	Liquid chromatography–mass spectrometry