Natural peptide probe screened for high-performance fluorescent sensing of copper ion: especially sensitivity, rapidity and environment-friendliness

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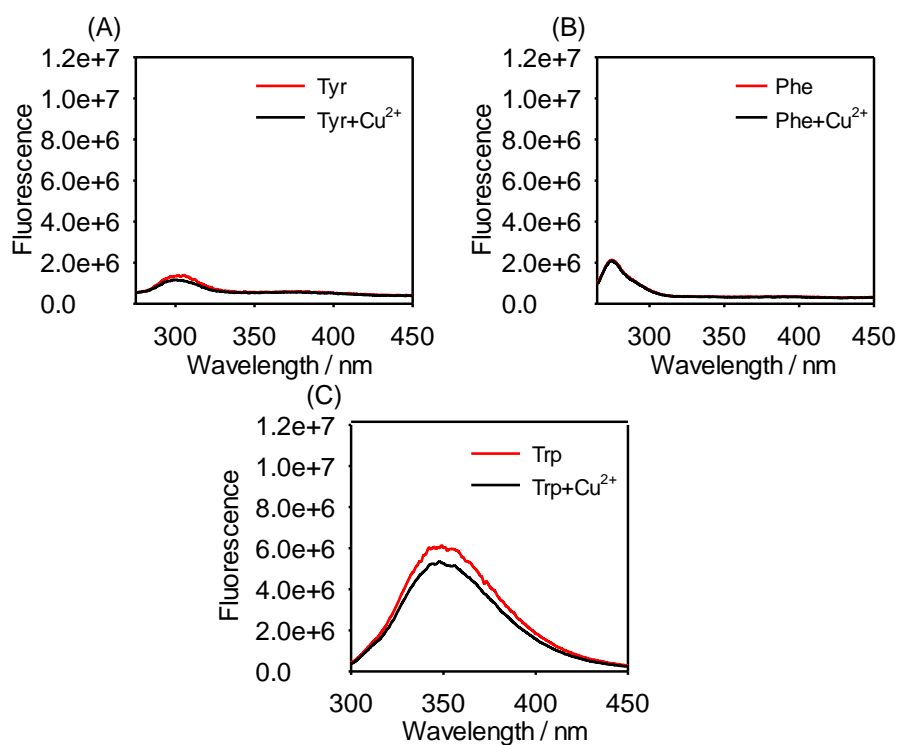
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Figure S1. Fluorescence monitoring of (A) tyrosine, (B) phenylalanine and (C) tryptophan before (red) and after (black) addition of Cu^{2+}. The concentration of each amino acid was 2.5 μM, the concentration of Cu^{2+} was 2.5 μM. There was low fluorescence emission of these monomers and negligible effect on their fluorescence was detected from the addition of Cu^{2+}.
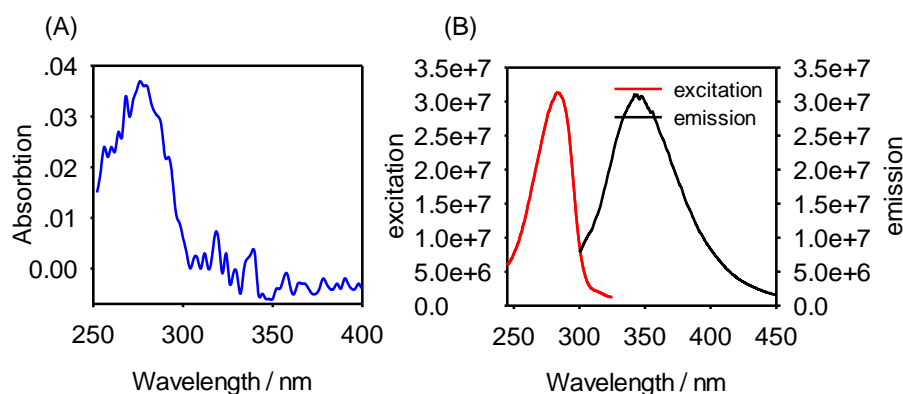
Figure S2. (A) Ultraviolet absorption spectrum of Trp-Phe, the concentration of Trp-Phe was 5 μM　(B) Fluorescence excitation (red) and emission (black) spectra of Trp-Phe. The concentration of Trp-Phe was 2.5 μM. All the detection system was 10 mM MOPS with 150 mM NaCl (pH=7.0).
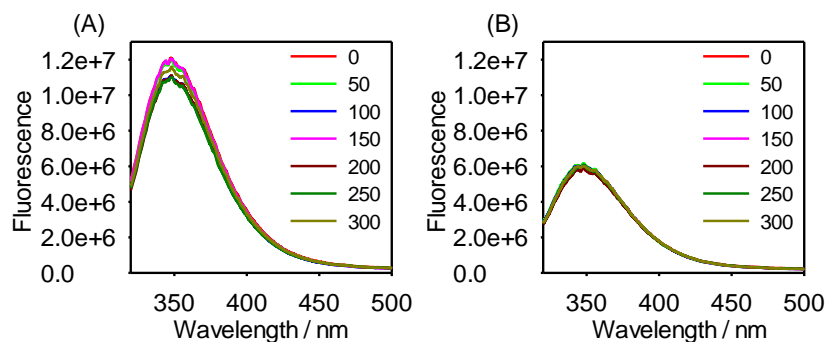

Figure S3. Fluorescence spectra of the screened Trp-Phe in the MOPS buffer (2.5 μM Trp-Phe, 10 mM MOPS, pH = 7.0) with different NaCl concentration (mM), before (A) and after (B) addition of Cu^{2+}. As the increase of NaCl concentration in the buffer solution, no matter whether there was Cu^{2+} (A) or not (B), the fluorescence intensity of Trp-Phe did not change obviously.
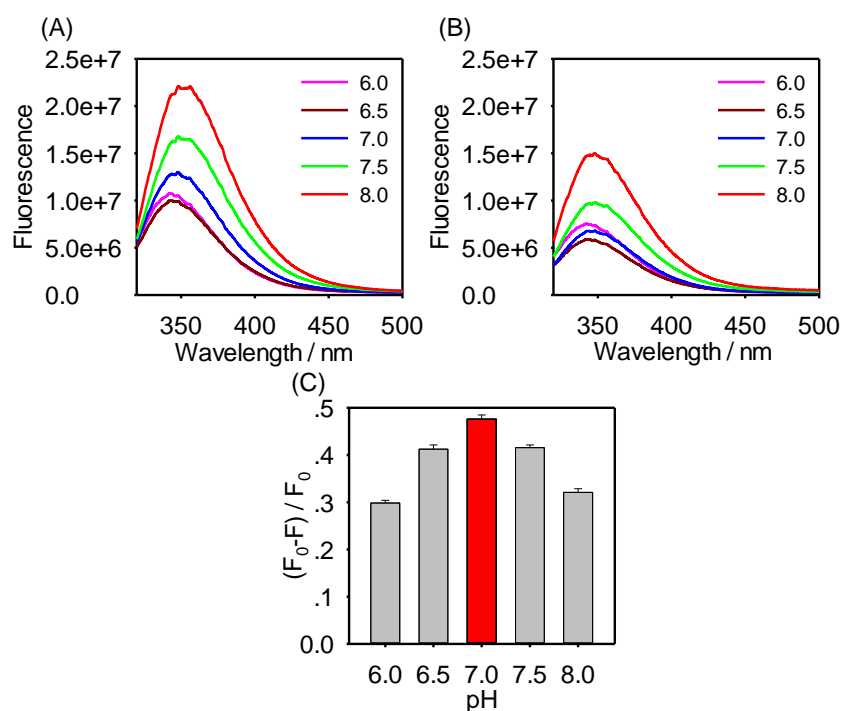
Figure S4. Evaluation of Cu^{2+} detection performance under different pH of probe. (A-B) Fluorescence spectra of the Trp-Phe system (10 mM MOPS, 150 mM NaCl, 2.5 µM Trp-Phe) before (A) and after (B) addition of Cu^{2+} under different pH. (C) The fluorescence decrease ratio ($(F_0-F) / F_0$, where F_0 is the fluorescence intensity of probe before addition of Cu^{2+}, and F is that after addition of Cu^{2+}) of the detection system under different pH. As a result, pH 7.0 was chosen as the optimal value, which is approximate to ambient condition and convenient for practical operation.
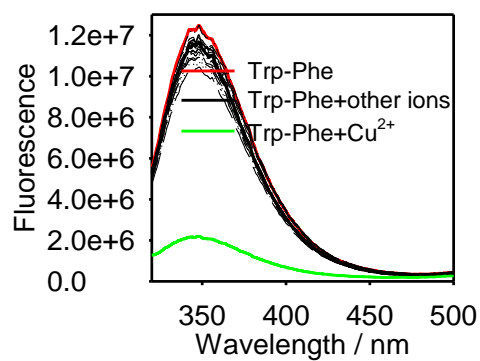
Figure S5. Fluorescence spectra of the system (10 mM MOPS, 150 mM NaCl, 2.5 µM Trp-Phe) after addition of different ions, the concentration of every ions was 2.5 µM. An observed depress of fluorescence peak of Trp-Phe was induced by the introduction of Cu^{2+}, while little change was resulted in by other ions.
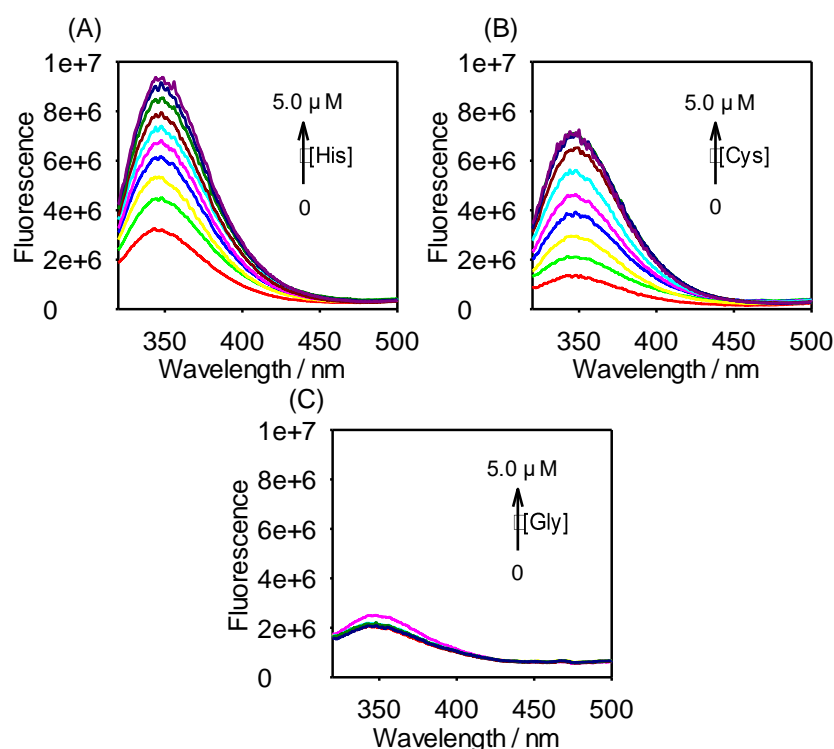
Figure S6. Fluorescence spectra of the Trp-Phe/Cu^{2+} system (10 mM MOPS, 150 mM NaCl, 2.5 μM Trp-Phe, 2.5 μM Cu^{2+}) in the presence of His (A), Cys (B) and Gly (C) in different concentrations. With increasing of the concentration of the selected amino acids, negligible change of fluorescence intensity could be detected when glycine was used, while gradual increase of fluorescence intensity could be observed when cysteine and histidine were used, which could be a persuasive certification of the concentration-dependent detoxification.