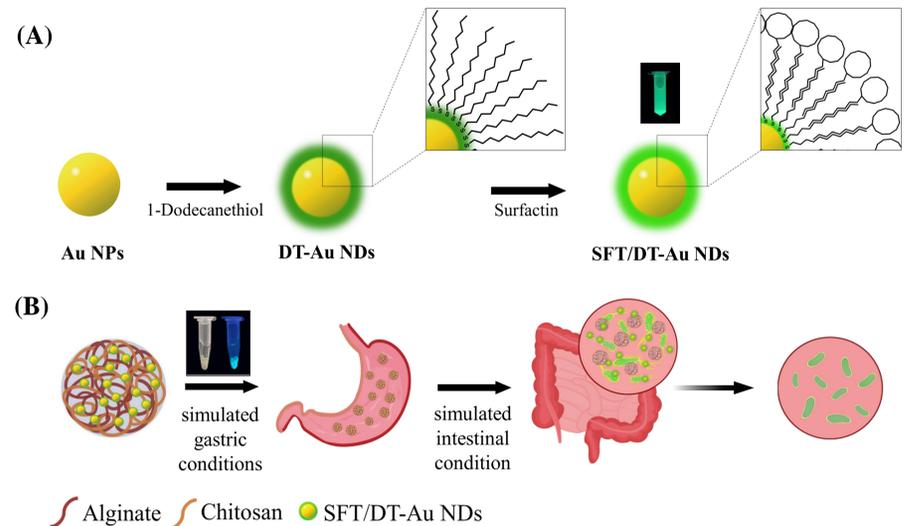


ABSTRACT

We reported a new strategy in designing antibacterial agents—alginate/chitosan/peptides gold nanodot hybrids, when antimicrobial peptides (Surfactin, SFT) presented on gold nanodots (Au NDs), show antibacterial activities against *Escherichia coli* (*E. coli*), without external sources of energy such as IR. Photoluminescent Au NDs are prepared via etching and codeposition of hybridized ligands, an antimicrobial peptide (surfactin; SFT), and 1-dodecanethiol (DT), on gold nanoparticles (~3.2 nm). As-prepared ultrasmall SFT/DT–Au NDs (size ~2.5 nm) are a highly efficient antimicrobial agent. Here, a alginate/chitosan/peptides gold nanodot hybrids was constructed via Ca^{2+} -induced self-assembly and studied through pH control for potential clinical applications.

Keywords: alginate, chitosan, surfactin, gold nanodot

SCHEME



Scheme. (A) Schematic diagram of gold quantum dot synthesis (B) Mechanism diagram of nano-antibacterial complex.

RESULTS AND DISCUSSION

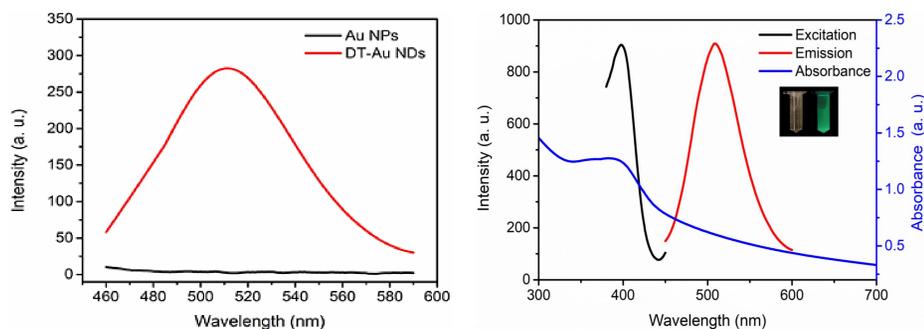


Figure 1. Excitation and emission spectra of DT-Au NDs in phosphate solution (pH 7.4).

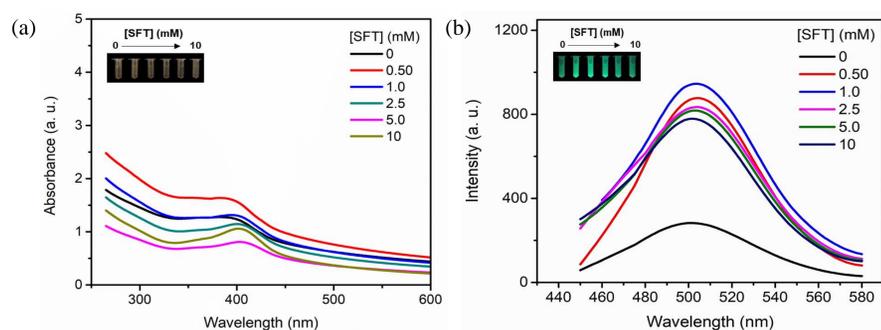


Figure 2. (a) UV-vis absorption (b) Fluorescence emission spectra of different concentrations SFT/DT-Au NDs and DT-Au NDs in phosphate solution (pH 7.4).

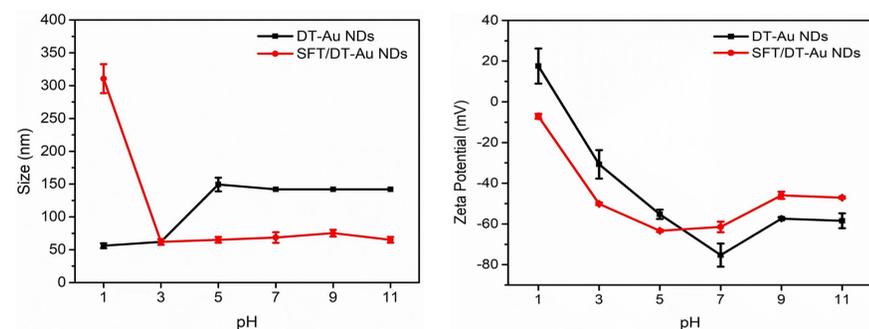


Figure 3. Size and Zeta potential of fluorescent DT-Au NDs and SFT/DT-Au NDs.

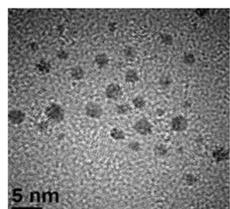


Figure 4. TEM images of SFT/DT-Au NDs.

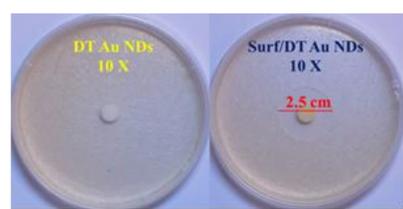


Figure 5. Growth inhibitory zone of DT-Au NDs and SFT/DT-Au NDs on *E. coli*.

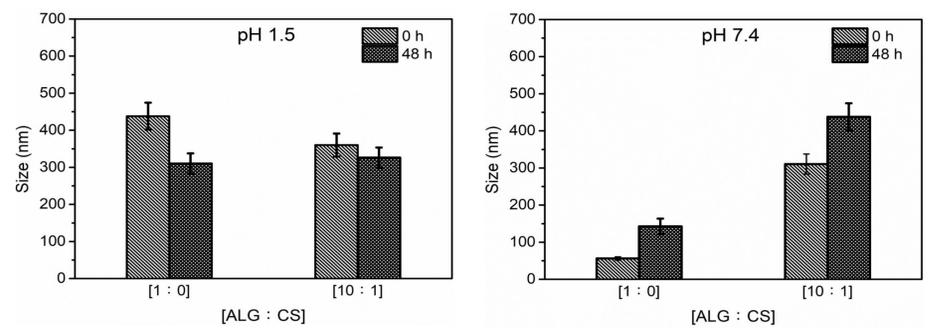


Figure 6. ALG/CS ratio of ALG/CS/SFT Au ND-hybrids pH-responsive experimental. DLS measurement results in phosphate solutions (pH 1.5 and 7.4) for 48 hours.

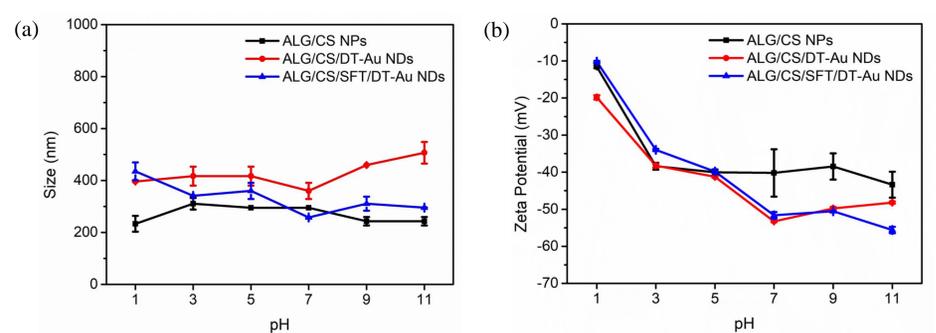


Figure 7. Different pH values of nano hydrogel (a) Size (b) Zeta.

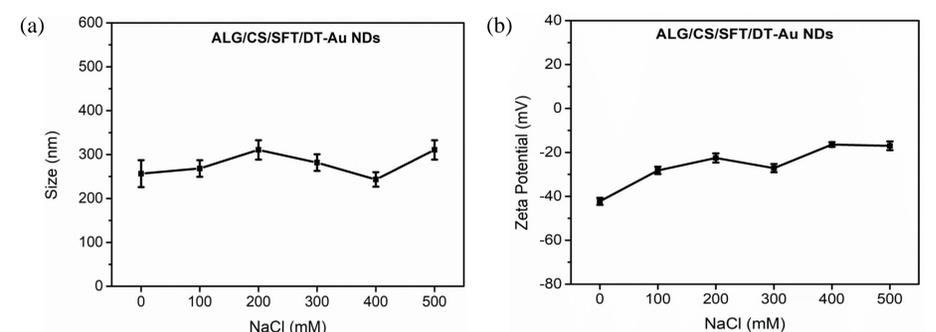


Figure 8. The salt effect of nano hydrogel (a) Size (b) Zeta.

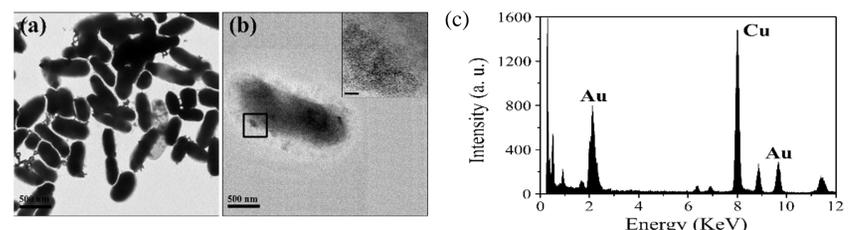


Figure 9. (a) SEM (b) TEM images of *E. coli* cells with SFT/DT-Au NDs. (c) EDX analysis of view of the enclosed with solid line in TEM image.

SUMMARY

- We have demonstrated that the antimicrobial peptide formed a dense shell on each core of photoluminescent Au NDs through self-assembly.
- SFT/DT-Au NDs were released through pH-dependent of ALG/CS NPs, it is in a stable state, will not be released due to rapid dissolution.

REFERENCES

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- Azevedo, M.; Bourbon, A.; Vicente, A.; Cerqueira, M. *International Journal of Biological Macromolecules* **2014**, 71, 141-146.