An efficient antibacterial approach utilizing glucose oxidase/magnetic nanoparticles/copper nanoflowers

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Bacterial contamination has been considered as a pressing issue since it provokes various problems ranging from bacterial infection, food spoilage to environmental pollution such as biofouling. Glucose oxidase (GOx)-copper hybrid nanoflowers embedded with amine-functionalized magnetic nanoparticles (NH_2-MNPs), denoted as 'MNP-GOx NFs', which are non-toxic and effective antibacterial agents have been successfully synthesized. Positively-charged NH_2-MNPs and negatively-charged GOx molecules are first interacted via electrostatic attraction which can be controlled by adjusting buffer pH, followed by the addition of copper(II) sulfate to induce the blooming of nanoflowers (MNP-GOx NFs) after 3-day incubation at room temperature. The NFs exhibited competent antibacterial activity by forming H_2O_2 from GOx-catalyzed glucose oxidation. In particular, 99.9% killings of *Staphylococcus aureus* and *Escherichia coli* are achieved after 3-hour treatment. MNP-GOx NFs have opened up a tremendous promise for their applications in a variety of fields such as biosensors, biofuel cells and bioconversion as well as bacterial de-contamination.