Camouflaged Edible QR Code Bioprinting: Combatting Medicine Counterfeiting

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Online pharmacies and social media platforms are responsible for the growing presence of fake and counterfeit medicines, and the verification and authentication of dosage levels are imperative for protecting individual medicines. However, the existing anti-counterfeit methods for medicines and exterior box-level protection are lacking, and they focus on pharmaceutical supply chains instead of empowering patients. In this study, we introduce camouflaged biosafe quick response (QR) code bioprinting and taggant construction for on-dose (or in-dose) medicine security, integrated with the dosage form. Machine-readable color QR codes contain concealed invisible patterns with biologically safe near-infrared absorption properties, which help enhance the security of conventional QR codes. The reported bioinkjet printing and protein-tagged construction approach guarantees printability, imperceptibility, stability, biocompatibility, digestibility, and tamper resistance, which are inherent components of each unit of medicine in their solid dosage formats. Camouflaged biosafe QR code taggants can offer various medical security applications including anti-counterfeit measures, authentication features, track-and-trace, and serialization at the dosage level. This approach is expected to empower patients to play an active role in fighting illicit medicines and pharmaceutical products.

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