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Research Article

Fast Colorimetric Method for the Detection of Captagon Based on a General Sensor Design Involving Aptamers and Gold Nanoparticles

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Abstract

Illicit drug use represents a worldwide health problem involving about 5% of world's adult population and contributing to crime misery and insecurity. A widely used illicit drug in Iraq in recent years is Captagon, which is second only to methamphetamine. It is also popular in Middle East especially in Syria, Saudi Arabia and Kuwait. It is the brand name of chemical compound Fenethylline, and it is a derivative substantial of amphetamines. It is amphetamine coupled with theophylline via an alkyl chain. We used a rapid, low-cost colorimetric assay for sensitive and visual detection of Captagon in real human samples using a Captagon-specific aptamer as the recognition element and original gold nanoparticles as indicators. The method indicated that the presence of Captagon resulted in gold nanoparticles (Au NPs) solution's color change from purple to blue. The method was rapid and also worked well in human urine samples, blood and hair. Colorimtric detection of Captagon could be measured either visually or by measurement of the absorbance intensity ratios at 650 and 520 nm, respectively. It worked in the 2 μM to 50 μM concentration range. Selectivity of captgon detection method was also investigated with illicit and licit drugs, which revealed that an obvious change both in absorption spectra and in visual color was observed upon the addition of Captagon, whereas slight and negligible change occurred in the presence of any examined drugs with the similar concentration as Captagon. Our findings presented that hair was a good example for detection of drug history of Captagon and other illicit drugs compared with urine and blood, which is believed to represent a widely applicable aptamer-based detection system.

Keywords: Gold nanoparticles; Captagon; Aptamer

Introduction

Illicit drugs are those for which nonmedical use is forbidden by the national or international laws. It represents a worldwide health problem involving about 5% of world's adult population and contributing to crime misery and insecurity [1, 2]. A widely used illicit drug in Iraq in recent years is Captagon. It is the brand name of chemical compound Fenethylline as active ingredients, and it is a derivative substantial of amphetamines. This chemical stimulant substance improves the mood and reduces the need to sleep as well as reduces appetite, with the regular use of Captagon for the aim of sex. It is amphetamine coupled with theophylline via an alkyl chain [3, 4]. It is second only to methamphetamine, and is also widely