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Coca Tea: Just an ordinary tea or inadvertent doping?

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Abstract

Introduction: In our on-going study of nutritional supplements available on the South African market we came across a product called Coca Tea. According to the packaging the consumption of Coca Tea is an age old Inca tradition for medicinal purposes. Coca Tea is made from the leaves of the plant *Erythroxylon coca*. The alkaloids in the leaves of this plant are used for cocaine production. Our test results of this product showed the presence of cocaine in the Teabags. **Aim:** The aim of this study was to determine the concentration of cocaine in the Coca Tea and if the consumption of this tea will result in an anti-doping-violation. **Method:** The cocaine content in the Coca Tea was determined by GC/MSD using a liquid-liquid extraction of an aliquot of a cup of Coca Tea prepared with a single teabag in hot water. An excretion study with three healthy male volunteers was performed who each drank an individually prepared cup of Coca Tea. Fractional urine collection was done at prescribed intervals. The benzoylecgonine in the urine samples was quantified by LC-MS/MS using a dilute and shoot method which is used for the routine screening of diuretics. **Results:** The results showed that a bag of Coca Tea contains approximately 0.5 mg of cocaine. All the volunteers had urinary concentrations of benzoylecgonine above the WADA MRPL of 100 ng/mL for stimulants from 2 hours post administration. The urinary concentration of benzoylecgonine in subject 2 dropped below the MRPL value at 24 hours post administration while for subject 1 and 3 the concentration dropped below the MRPL at 36 hours post administration. The highest concentration of benzoylecgonine found in a sample was 2044 ng/mL at 6 hours post administration. Benzoylecgonine could be detected up to 48 hours in the urine samples. **Conclusion:** The results of this study showed that Coca Tea on the South African market contains cocaine and that drinking one cup of Coca Tea will result in an anti-doping violation for benzoylecgonine.

Introduction

In our on-going study of nutritional supplements available on the South African market we came across a product called Coca Tea. According to the packaging the consumption of Coca Tea is an age old Inca tradition for medicinal purposes. Coca Tea is made from the leaves of the plant *Erythroxylon coca*. The alkaloids in the leaves of this plant are used for cocaine production. Our test results of this product showed the presence of cocaine in the Tea bags. The aim of this study was to determine the concentration of cocaine in the Coca Tea and if the consumption of this tea will result in an anti-doping violation.

Experimental

Determination of the concentration of cocaine in Coca Tea

Extraction: A cup of Coca Tea was prepared by adding 50 mL hot water to 1 tea bag. 100 μ L of this tea was diluted with 900 μ L water. After addition of 50 μ L of internal standard solution (loxapin) and 200 μ L of K_2CO_3 / $NaHCO_3$ buffer solution (pH 9.6) the mixture was extracted with 4 mL TBME by shaking horizontally on a mechanical shaker for 5 min. This was followed by centrifugation at 3000 rpm for 5 minutes where-after the organic layer was transferred to a 5 mL ampoule and evaporated to dryness under a stream of nitrogen. The residue was dissolved in 100 μ L toluene and 2 μ L injected onto the GC/MSD system. Three different flavours of Coca Tea were analysed, 3 different tea bags of each flavour. A 5 point calibration curve was used to calculate the concentration of cocaine in the tea.

Instrumentation: The GC/MSD System was an Agilent 6890N gas chromatograph coupled to a 5973 inert mass spectrometer. A 5% phenyl-methylsilicone capillary column (15 m x 0.25 mm i.d. x 0.25 µm film thickness) was used. The initial oven temperature was at 80°C and increased at 20°C/min to 300°C. Helium was used as carrier gas at constant flow of 1 mL/min. The mass spectrometer was operated in SIM mode monitoring the ions m/z 303 for cocaine and m/z 327 for loxapine. *Excretion study* 3 Health male volunteers each took one cup of Coca Tea prepared in 50 mL hot water as above. Urine samples were collected before (0h) and at 2, 4, 8, 12, 24, 30, 36 and 48 hours post administration. To 50 µL of urine was added 200 µL 0.1% formic acid in water containing mefruside as internal standard. The mixture was centrifuged for 5 min at 10 000 rpm and 5 µL injected into the LC-MS/MS system for quantification of benzoylecgonine, metabolite of cocaine.

Instrumentation: The LC-MS/MS system consisted of a Shimadzu LC-20AB liquid chromatograph connected to a API Q-trap 5500 tandem mass spectrometer. Analysis was performed on a Synergi C18 4u fusion-RP 80A column (50 mm x 2 mm). Mobile phase A was 0.1% formic acid and B was acetonitrile. The gradient was 0-7 min A: 95%, B: 5%, 7-9 min A: 0%, B: 100%, 9-11 min A: 95%, B: 5%. The LC-MS/MS was operated in the MRM mode and the diagnostic ions monitored were m/z 290-168 for benzoylecgonine and m/z 381-78 for mefruside. A 5 point calibration curve was used to calculate the concentration of benzoylecgonine in urine.

Results and Discussion

The results showed that a bag of Coca Tea contains approximately 0.4 mg of cocaine. After the intake of one cup of Coca Tea prepared from one tea bag all the volunteers had urinary concentrations of benzoylecgonine above the WADA MRPL of 100 ng/mL for stimulants from 2 hours post administration. The urinary concentration of benzoylecgonine could be detected above the MRPL of 100 ng/mL for longer than 24 hours for subject 2 and for longer than 36 hours for subject 1 and 3. The highest concentration of benzoylecgonine found in a urine sample was 2044 ng/mL at 6 hours post administration. Benzoylecgonine could be detected up to 48 hours in the urine samples. Cocaine was detected in some of the urine samples using Screen I. It is interesting to note the declaration from the manufacturers on the bottom of the packaging which state that they support the war against drugs.

	Tea bag 1 (mg)	Tea bag 2 (mg)	Tea bag 3 (mg)
Coca Tea	0.43	0.43	0.41
Coca Tea – Lemon Verbena	0.42	0.42	0.41
Coca Tea – Eucalyptus and Andean Mint	0.47	0.47	0.41

Table 1: Concentration of cocaine in different Coca Tea flavours

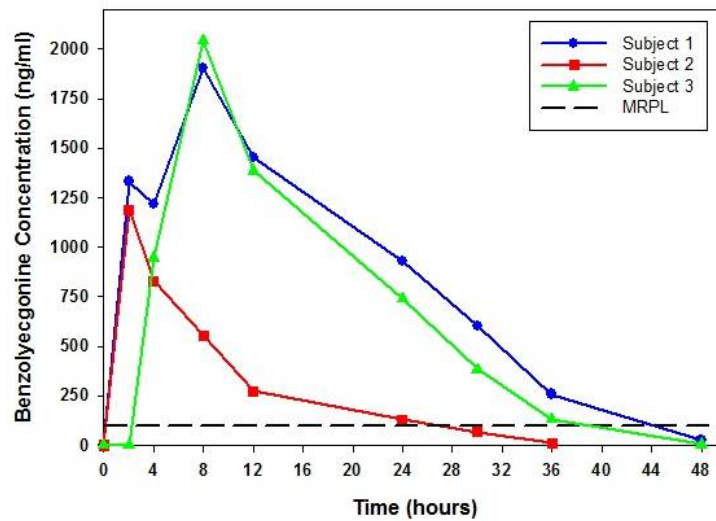


Figure 1: Urinary concentrations of benzoylecgonine in 3 healthy male volunteers after drinking 50 mL of Coca Tea (1 cup)

Conclusions

The results of this study showed that Coca Tea on the South African market contains cocaine and that drinking one cup of Coca Tea will result in an anti doping violation for benzoylecgonine. The South African Authorities were informed that the Coca Tea products available over-the counter do contain cocaine and the products were subsequently removed from the market and are no longer available over-the-counter.

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