

# Methcathinone derivatives: Findings from test purchases of capsules and powders from the Internet



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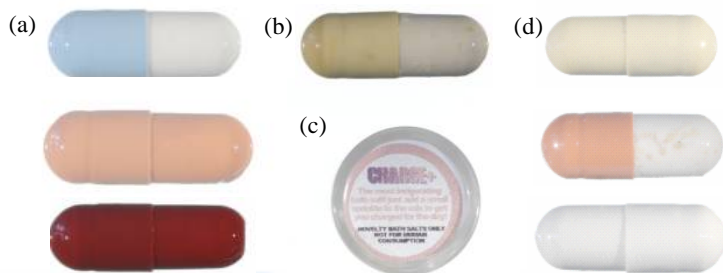
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## Introduction

Cathinone (Cath) is a pharmacologically active alkaloid (stimulant) extracted from the leaves of the Khat plant (*Catha edulis*). Khat leaves are chewed recreationally in Somali and Ethiopian communities to produce a mild high much like caffeine from tea and coffee<sup>1</sup>. Human metabolism of cathinone produces cathine and norpseudoephedrine, structurally similar to amphetamine and epinephrine. Cath and methcathinone (MC) are controlled under the UK Misuse of Drugs Act (Class C and B respectively)<sup>2</sup>. However, derivatives such as ethcathinone (EC), 4-methylmethcathinone (4-MMC) and 3-fluoromethcathinone (3-FMC), which are not controlled under current UK law, have been produced and marketed to satisfy the drug dance scene culture. The safety of these products has not been evaluated and they are often sold in products where the contents are not accurately declared.

## Purchases

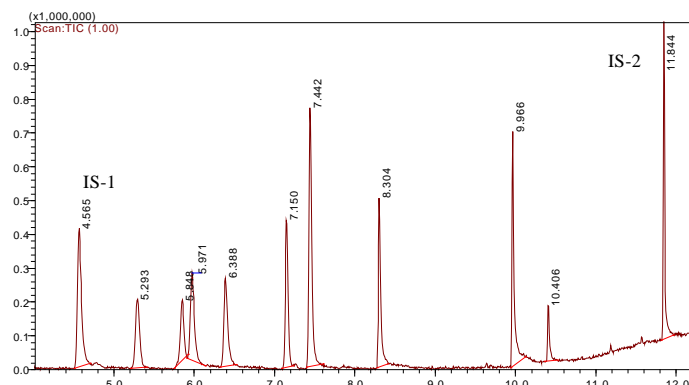
Seven products, were purchased from the BioRepublik<sup>3</sup> website, sold as 'legal alternatives to ecstasy'. They were described as 'Neorganics' and included two generations of products. The first being 'Neo-Dove 1' – "a well known, best seller, unique supplement designed especially to be the ultimate influence". 'Neo-Dove 2' is the next generation – "a superior supplement that will make you feel vital and happy". All were supplied in one container labelled as 'Multivitamins'. One powder purchased from EveryoneDoesIt.com<sup>4</sup> called 'Charge+' was sold as 'Novelty Bath Salts' and was labelled 'Not for human consumption'. Three products with similar names to those on the BioRepublik site were purchased from the Future Legals<sup>5</sup> website. Each product was analysed to determine identifiable compounds and some are shown in figure 1.



**Figure 1:** Some of the products purchased; (a) BioRepublik.com containing both EC and 4-MMC. (b) BioRepublik.com containing 3-FMC (c) EveryoneDoesIt.com containing 3-FMC (d) Futurelegals.co.uk containing 3-FMC

## Methods

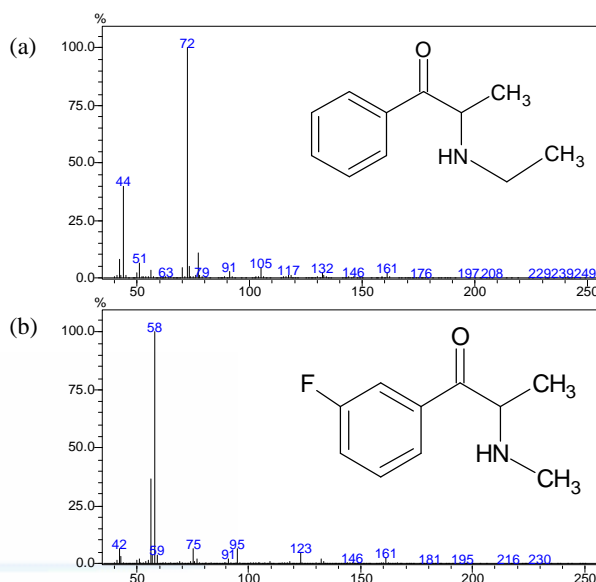
A screening method was developed for ten methcathinone related compounds (Cath, MC, EC, 4-MMC, 2-FMC, 3-FMC, 4-FMC dimethylcathinone (DMC), 4-methoxymethylaminobutyron (4-MAB) and 4-methoxymethcathinone (4-MoxyMC)). Cath and MC were purchased from Sigma-Aldrich. Derivatives of Cath and MC were synthesised 'in-house' by Kingston University. The contents of capsules or powders were dissolved in methanol and analysed by gas chromatography with mass-spectrometric (GCMS) detection in scan mode. Chromatographic separation was achieved for all derivatives over a 12min run. The principle fragment ion for MC, 4-MMC, 3-FMC, 4-FMC and 4-MoxyMC was  $m/z$  58; for DMC, EC and 4-MAB  $m/z$  72 and 44; and for 2-FMC  $m/z$  161, 132 and 91. Confirmation of methcathinone derivatives was performed by acetylation, using acetic anhydride, over a 20min run. An additional compound was seen in all capsules and standard containing 3-FMC. Preliminary investigation by NMR, MS and IR identified it as 3-fluoroisomethcathinone, a by-product of the synthesis of 3-FMC. Further investigation is needed to determine if this compound is active.



**Figure 2:** GCMS chromatogram showing the separation of nine methcathinone derivatives: In order of elution; IS-1 (Quinoline), 3-FisoMC, 3-FMC, 4-FMC, MC, DMC, EC, 4-MMC, 4MoxyMC and 4-MAB and IS-2 (Pyribenzamine). 2-FMC is not shown.

## Results

Four capsules contained both EC and 4-MMC, in addition to caffeine; six capsules and the powder contained 3-FMC, with three of these also containing caffeine. The products ordered from BioRepublik were packaged together labelled as 'Multivitamin' and, although the capsules were different colours, it was not possible to identify the individual products by name.



**Figure 3:** Mass spectra and structure of (a) EC (DMC & 4-MAB give similar  $m/z$  72), (b) 3-FMC (4-MMC, MC, 4-FMC & 4-MoxyMC give similar  $m/z$  58)

## Conclusions

This market is adapting rapidly to changes in demand and legislation. Many similar products are sold openly in high street shops and legal high websites in packaging that does not reflect the contents, effects or uses. They are often sold under the disguise of a 'safe alternative to illicit drugs' despite not undergoing any quality control or evaluation of their safety in human subjects.

## References

- [1] Manghi, RA *et al.* *J Psychoactive Drugs*. 2009 Mar;41(1):1-10. [2] King LA *Drugs of Abuse: Classification, including Commercial Drugs* 2004:626-631 [online at [www.sciencedirect.com](http://www.sciencedirect.com). Accessed 31 Jul 09.
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