‘Legal highs’ - Analysis of tablets and capsules containing piperazines

Analytical Unit, St Georges, University of London, UK
Susannah Kenyon, Jennifer Button, John Ramsey and David W Holt

Introduction
The use of ‘legal highs’ or ‘party pills’ has exploded over the last two years, in the media as well as on the high street. The ‘new’, popular ingredient in the tablets and capsules sold in numerous online shops, is a group of synthetic drugs called piperazines. The majority of products usually sold in such outlets are of a herbal nature and have been in existence for a decade. Piperazines, although not herbal, are being sold in online shops due to their psychoactive properties, legal status and perceived safety compared with illicit drugs.

Benzylpiperazine (BZP) is the most common derivative and is a labelled ingredient in a wide number of products on sale across the internet1 (figure 1 and 2). They have become increasingly popular over the last two years due to their amphetamine-like effects and legal status.2,3 Piperazine itself (figure 3) was originally used as an antihelmintic agent to treat round worm and is still used today in medicine as a worming agent. Derivatives were further investigated in the 1970’s but trials were stopped when it was discovered that benzyl derivatives had stimulant properties with abuse potential. Today, benzyl and phenyl derivatives such as those in figure 3 are seen alone or combined with BZP or other piperazine derivatives, in tablets and capsules sold as ‘party pills’ or ‘harm reduction solutions’ (figure 2) for use on the dance scene.3,4

Materials and Methods
26 different tablets and capsules were purchased from three different internet suppliers; Spiritual High (5), Everybody Does It (12) and Wicked Highs (8). One tablet was supplied by a clinician from a hospital admission. 11 piperazine derivative standards were purchased from Sigma-Aldrich. A Shimadzu QP2010 gas chromatograph and mass spectrometer with an HP5MS column (30m x 0.25mm, 0.50µm) was used for screening and quantitation.

Screening – Tablets were ground to a homogenous powder and a proportion of this was analysed. Alternatively, the whole tablet or capsule contents was mixed with methanol (10mL), major ingredients centrifuged at 3000rpm, 50µL of methanoic sample was combined with 100µL of 100mg/L internal standard solution (quinoline, pyribenzamine and flurazepam) and mixed with 1mL MTBE. 1µL was injected onto the GC-MS system at 225°C with a 10:1 split. The temperature was held at 80°C for 4 minutes and then ramped at 40°C/min until 290°C, and held for 10.75 minutes. Samples were diluted and analysis repeated if necessary.

Quantitation – The major ingredients, BZP and TFMPP, were measured in those tablets/capsules that contained them. All samples containing one or more piperazine stated ingredients as ‘BZP, and other piperazine and piperine blends’, ‘Cayenne pepper piperine blend’ or ‘Piperazine and piperine blend’.

Conclusions
This small study has shown that there is a wide variety of products available on the internet containing piperazines. The results show that not only do these tablets and capsules contain different/additional piperazines to those declared on the packaging, but the quantities contained are highly variable and unpredictable. It is clear that party pills, with their amphetamine-like effects, legal status and positive marketing are increasing their popularity and their growing use should not be ignored.