

## Potential doping substances detected in boosters in Poland

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### *Abstract*

In 2003 the World Anti-Doping Agency (WADA) took responsibility for the List of substances and methods prohibited in sport (the Prohibited List). Since that moment the list has been regularly updated, and all changes, based mainly on scientific research, have been preceded by numerous consultations with representatives of the sport and medicine. By publishing a new version of the Prohibited List every year and by enlisting numerous examples of prohibited substances WADA fulfilled partly the need of publishing a complete list of prohibited substances. However, the Prohibited List still has an open character. In spite of the examples of prohibited substances or methods in particular groups, some additional substances, which are not located on the list but are characterized by “a similar chemical structure or similar biological effect(s)”, can be considered as doping.

### *Introduction*

In recent years several well-known Polish athletes have personally found out what this definition means. In their urine samples 4-methyl-2-hexaneamine and beta-methylphenylethylamine were detected during the doping control. These substances, which were found also in dietary supplements, were not mentioned on the WADA Prohibited List at the time. However, both substances were recognized by WADA as banned in sport because of chemical similarity to the structure of tuaminoheptane and amphetamine.

Potential doping substances can be also ingredients of boosters (legal highs, smarts, party pills). This work presents the results of analyses of several products from Polish market

### *Materials and Methods*

The laboratory analysed 50 boosters available on the polish market. Samples were analysis by GC-MS in a SCAN mode (GC5890 – MS5975N, Agilent Technologies). GC program: 65°C

(2,00 min); 250 °C (15 °C/min, 6,00 min); 300 °C (20 °C/min, 4,00 min): Column: HP-5MS, 0.25 mm, ID 0.25 mm, 12 m. Injection volume 1 µL, Splitless.

Standards were purchased from LGC Standards (Poland).

### *Results and Discussion*

During the analysis laboratory found substances as follow (in alphabetical order):

**butylone** (bk-MBDB; 1-(1,3-benzodioxol-5-yl)-2-(methylamino)butan-1-one)

**caffeine**; (1,3,7-trimethyl-1*H*-purine-2,6(3*H*,7*H*)-dione)

**DBZP** (dibenzylpiperazine;1,4-dibenzylpiperazine)

**ephedrine artefact** (3,4-dimethyl-5-phenyl-1,3-oxazolidine)

**ethylone** (1-(1,3-benzodioxol-5-yl)-2-(ethylamino)propan-1-one)

**JWH-081** (4-methoxynaphthalen- 1-yl- (1-pentylindol- 3-yl)methanone)

**MBZP** (methylbenzylpiperazine;1-methyl-4-(phenylmethyl)piperazine;1-methyl-4-benzylpiperazine;1-benzyl-4-methylpiperazine)

**MDPV** (methylenedioxyprovalerone;1-(benzo[d][1,3]dioxol-5-yl)-2-(pyrrolidin-1-yl)pentan-1-one)

**4-MEC** (4-methyl-N-ethylcathinone)

**metamfepramone** (2-(dimethylamino)-1-phenylpropan-1-one)

**methedrone** (bk-PMMA;1-(4-methoxyphenyl)-2-(methylamino)propan-1-one)

**methylone** (bk-MDMA; (±)-2-methylamino-1-(3,4-methylenedioxyphenyl)propan-1-one)

**lidocaine** (2-(diethylamino)-N-(2,6-dimethylphenyl)acetamide)

**pFPP** (para-Fluorophenylpiperazine1-(4-fluorophenyl)piperazine)

**3-Phenyl-1H-pyrazole** (5-phenyl-1H-pyrazole)

**pentylone** (bk-MBDP; (±)-1-(1,3-benzodioxol-5-yl)-2-(methylamino)pentan-1-one)

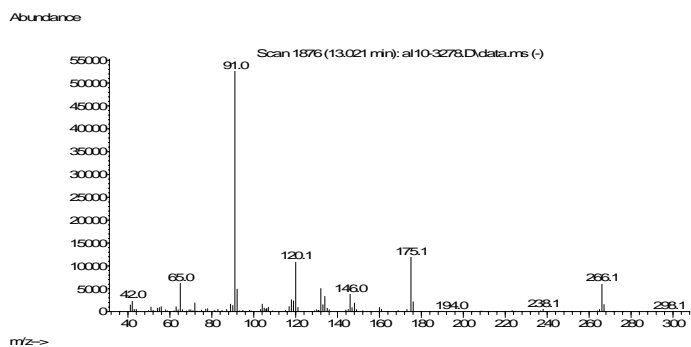
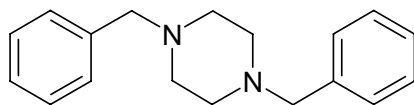
**TFMPP** (trifluoromethylphenylpiperazine;1-[3-(trifluoromethyl) phenyl]piperazine)

All substances detected by the Warsaw Anti-Doping Laboratory may be reported as potential doping substances.

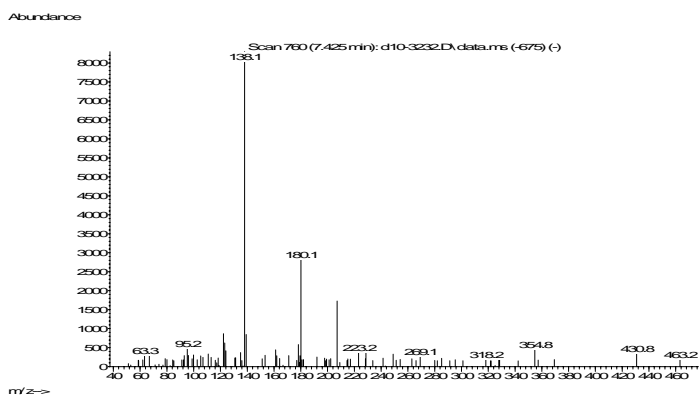
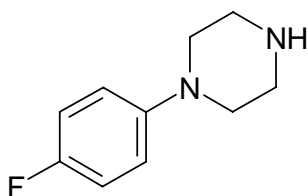
The following substances for which the structure and MS spectrum is shown match the definition of doping substances due to their chemical similarity to items mentioned in the *PROHIBITED LIST*. Many other compounds found also could be doping substances eg methcathinone derivatives etc..

## 1) class S6 STIMULANTS

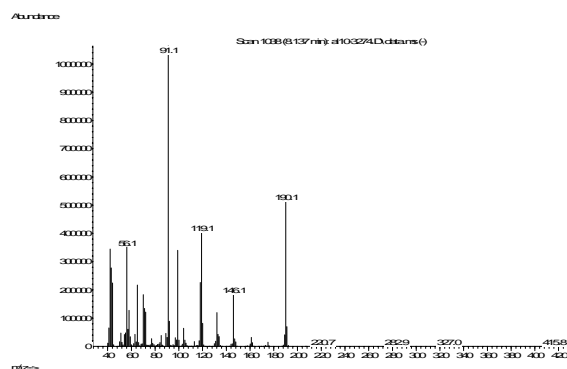
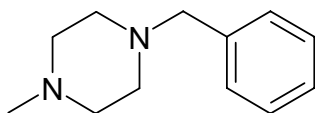
- **DBZP** (dibenzylpiperazine; 1,4-dibenzylpiperazine)



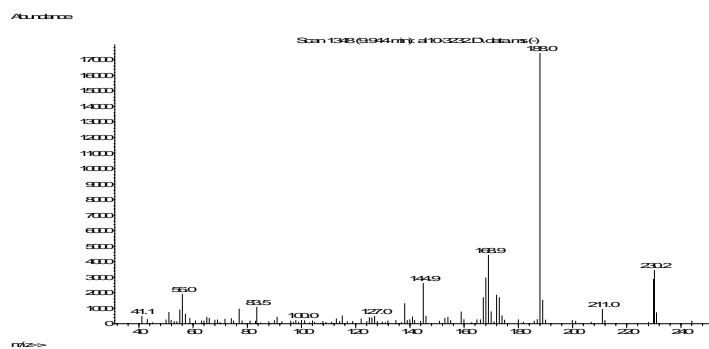
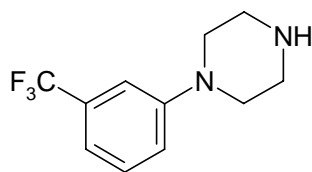
- **pFPP** (para-Fluorophenylpiperazine 1-(4-fluorophenyl)piperazine)



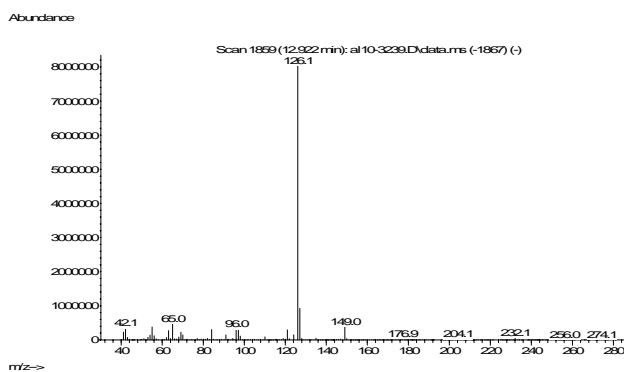
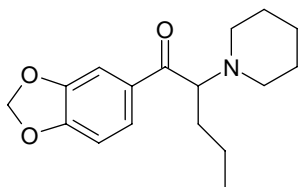
- **MBZP** (methylbenzylpiperazine; 1-methyl-4-(phenylmethyl)piperazine; 1-methyl-4-benzylpiperazine; 1-benzyl-4-methylpiperazine)



- **TFMPP** (trifluoromethylphenylpiperazine;1-[3-(trifluoromethyl) phenyl]piperazine)

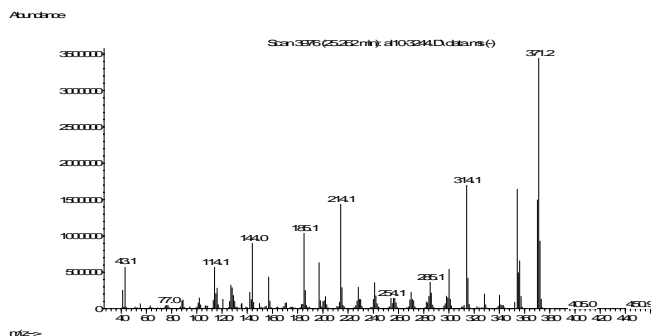
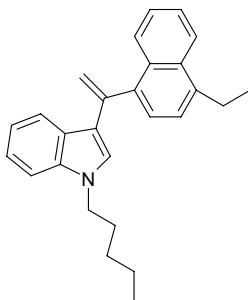


- **MDPV** (methylenedioxypropylvalerone;1-(benzo[d][1,3]dioxol-5-yl)-2-(pyrrolidin-1-yl) pentan-1-one)



## 2) class **S8** CANNABINOIDS

- **JWH-081** (4-methoxynaphthalen- 1-yl- (1-pentylindol- 3-yl)methanone)



### References

1. Perrenoud L, Saugy M, Saudan C. (2009) Detection in urine of 4-methyl-2-hexaneamine, a doping agent. *J Chromatogr B*, **877**, 3767-3770.