Psychopharm

*Journal of Psychopharmacology*
19(6) (2005) 675–679

ISSN 0269-8811
SAGE Publications Ltd, London, Thousand Oaks, CA and New Delhi
10.1177/0269881105056660

# New trends in the cyber and street market of recreational drugs? The case of 2C-T-7 ('Blue Mystic')

Fabrizio Schifano *Division of Mental Health – Addictive Behaviour, St George's Hospital Medical School, University of London, London, UK.*
Paolo Deluca *Division of Mental Health – Addictive Behaviour, St George's Hospital Medical School, University of London, London, UK.*
Lisa Agosti *Division of Mental Health – Addictive Behaviour, St George's Hospital Medical School, University of London, London, UK.*
Giovanni Martinotti *Department of Psychiatry, Catholic University, Rome, Italy.*
John M. Corkery *Division of Mental Health – Addictive Behaviour, St George's Hospital Medical School, University of London, London, UK.*
The Psychonaut 2002 Research Group* **(Alphabetical order): Baldacchino Alex (UK), Bonan Caterina (I), Bothas Heikki (SF), Brigada Raffaella (I), Comacchio Anna (I), Di Furia Lucia (I), Duarte Rui Eastwood Dorte (I), Farre' Magi (E), Ferreira Susana (P), Flores Irene (P), Guionnet Claude (F), Harder Lisbet (DK), Stokholm Jensen Lene (DK), Leoni Mauro (I), Littlejohn Christopher (UK), Majava Aino (SF), Peltoniemi Teuvo (SF), Pizza Milena (I), Rawaf Salman (UK), Robert Damien (F), Rossi Maria Angela (I), Rovetto Francesco (I), Scherbaum Norbert (D), Siemann Holger (D), Tarrago Josep (E), Torrens Marta (E), Zambello Francesco (I).*

## Abstract

2C-T-7 ('Blue Mystic'), an illicit compound which shows similarities with MDMA and other designer drugs, has been only occasionally identified in the EU, but discussion on the Internet between experimenters has recently grown significantly. We aimed at collecting together in a review the available information on 2C-T-7, both at the cyber and at the street market level. 2C-T-7 was first synthesized in 1986; its desired effects include both a sense of empathy and of well-being. Hallucinations, nausea, anxiety, panic attacks and paranoid ideation are anecdotally reported. According to the different European sources here approached, the availability of 2C-T-7 at street level seems to be currently very low, although one death related to a mono-intoxication with 2C-T-7 has been documented in the USA. With respect to information on 2C-T-7 available online, due to both redundancy and relevance issues the initial identified sample of 360 was reduced to 118 websites. In 14 (11.9%) websites, the detailed description of the 2C-T-7 synthesis was given. Harm Reduction websites appeared significantly earlier in the search engines results' list than Anti drugs ($p = 0.006$) websites. Five (4.2%) websites apparently offered 2C-T-7 for sale. The large body of knowledge available online seems to contrast with small numbers of seizures at street level; an exhaustive web mapping of drug-related issues may be of interest for the clinician. Projects aimed at designing more 'attractive' prevention websites should be planned and future studies should better assess the characteristics of those consumers who take advantage of the online information of hallucinogenic compounds.

### Keywords
2C-T-7, phenethylamines, hallucinogens, MDMA, ecstasy, drug abuse, Internet, online sales, drug abuse prevention, designer drugs

## Introduction

For a number of hallucinogenic compounds which have appeared in the drug market in the last few years, scientifically sound and controlled literature data are lacking. This is especially true for a number of psychedelic drugs, including 2C-T-7 (2,5-dimethoxy-4-(n)-propylthiophenethylamine). Therefore, it is of potential value for future research in this area to collect together in a review the available clinical and pharmacological data on 2C-T-7 and the information on its use, both at the cyber and at the street market level.

## 2C-T-7: preclinical and clinical pharmacological issues

2C-T-7, first synthesized in 1986, is the most famous compound of a group of 24 phenethylamine homologues that show a wide

*Corresponding author*: Dr Fabrizio Schifano, Senior Lecturer and Consultant Psychiatrist, Division of Mental Health – Addictive Behaviour, St George's Hospital Medical School, University of London, Cranmer Terrace, London, SW17 0RE, UK. *Email*: fschifan@sgul.ac.uk, *Website*: http://www.psychonaut2002.org

and varied psychopharmacology (Totse, 2004), with 2C-T-2, 2C-T-4 and 2C-T-7 (the S-ethyl, S-isopropyl and S-propyl) being both potent and LSD-like (Peyton and Shulgin, 1994). 2C-T-7 is reported to have 15 times the mescaline potency (Peyton and Shulgin, 1994). The 2C-T compounds have structural and pharmacodynamic properties similar to other phenethylamine hallucinogens, such as mescaline, MDMA (3,4-methylenedioxymethamphetamine; 'ecstasy') and PMA (para-methoxyamphetamine) (Curtis *et al.*, 2001). According to Khorana *et al.* (2004), however, 2C-T-7 seems best classified as a DOM [1-(2,5-dimethoxy-4-methylphenyl)-2-aminopropane]-like hallucinogen. The phenethylamine and indoleamine hallucinogens, despite differences in their chemical structure, display similar clinical effects and cross-tolerance in human studies (Balestrieri and Fontanari, 1959; Curtis *et al.*, 2001). There is an excellent correlation between the affinity of both indoleamine and phenethylamine hallucinogens for 5-HT2 and, to some degree, 5-HT1, receptors on the one hand and their hallucinogenic potency in humans on the other (Titeler *et al.*, 1988; Glennon, 1990; European Monitoring Centre for Drugs and Drug Addiction, 2004). More specifically, there is evidence from both biochemical (Sanders-Bush *et al.*, 1988) and behavioural (Glennon, 1990; Marek and Aghajanian, 1996; Gewirtz and Marek, 2000) studies that both 5-TH2A and 5-TH2C receptors' subgroups, in both rodents and humans, are involved (Marek and Aghajanian, 1996; Vollenweider, 1998; Backstrom *et al.*, 1999; Aghajanian and Marek, 1999). At present, there are no animal or human data concerning general toxicity or neurotoxicity potential of 2C-T-7, which does not have any known medical or industrial use.

2C-T-7 is typically available as powder or tablet; its primary route of administration is oral, at a dosage of 10–30 mg. Insufflation (snorting) is also commonly mentioned in user reports. After oral ingestion, 2C-T-7 peak plasma levels are observed in about 1–2.5 h; its psychoactive effects may last up to 5–15 h. If 2C-T-7 is snorted, peak plasma levels may be reached quicker (Stolaroff and Wells, 1993; Hardison, 2000; Murple, 2001; European Monitoring Centre for Drugs and Drug Addiction, 2004). It seems that 2C-T-7 may be excreted unchanged, with oxidative deamination being the main metabolic pathway (Murple, 2001). A screening method for 2C-T-7, based on gas chromatography–mass spectrometry, has been recently developed (Vorce and Sklerov, 2004).

2C-T-7 desired effects include both a sense of closeness to others (empathy) and a sense of well-being. Reported adverse effects include: visual/auditory hallucinations, nausea and vomiting, headache, hypertension, tachycardia, gastrointestinal disturbances, muscle tension, tremor, anxiety, panic attacks, paranoid ideation, memory disturbances and confusion (Stolaroff and Wells, 1993; Hardison, 2000; European Monitoring Centre for Drugs and Drug Addiction, 2004).

Three deaths have been reported in the USA after 2C-T-7 snorting (Curtis *et al.*, 2001). In one case, 2C-T-7 was insufflated, at a dosage of 35 mg, on its own (Curtis *et al.*, 2003). In the remaining two cases, the compound was taken together with MDMA (European Monitoring Centre for Drugs and Drug Addiction, 2004).

A number of MDMA-like compounds are controlled as Class A drugs in the UK. Most of them, including MDEA, 2C-I, 2C-T-2, 2C-T-7 and TMA-2, have been controlled since 1977 by a regulation which covers the generic phenethylamine structure. The compound is also controlled in all EU member states, in the USA and in Canada.

## The 2C-T-7 European street market

2C-T-7 ('Blue Mystic') popularity started in 1997, when it became possible to purchase it from some German and Dutch 'smart shops'. De Boer *et al.* (2004) collected data related to phenethylamines of the 2C-series in Dutch smart shops during the period 1994–2002. All products that were claimed to contain synthetic drugs and sold in the premises were purchased. Most of the purchased products proved to contain one of the phenethylamine designer drugs 2C-B, 2C-T-2 or 2C-T-7. The availability of the compound at street level seems to be currently very low, notably in Europe. In December 2004, for the purpose of the present study, updated information on 2C-T-7 was sought from both the UK Forensic Science Service and National Criminal Intelligence Service, but nothing specifically related to it was reported to us. In the UK, a dance music magazine survey of nearly 500 respondents carried out in 2002 found no one had ever tried 2C-T-7, but an Internet survey of 2C-T-7 users obtained 423 valid responses from people who had taken 2C-T-7 (European Monitoring Centre for Drugs and Drug Addiction, 2004).

In the last few years, law enforcement agencies from different Member States have reported to Europol that there is no information available which would suggest large-scale production, distribution of and/or trafficking in 2C-T-7 or a role for organized crime in these activities (European Monitoring Centre for Drugs and Drug Addiction, 2004). Five EU Member States (the Netherlands, Finland, France, Germany, Sweden) reported, in the last few years, small scale seizures of 2C-T-7. In the UK, the REITOX National Focal Point reported to the EMCDDA on the finding of $3\frac{1}{2}$ tablets of 2C-T-7 in an amnesty bin in a London club in 2000. On the basis of available information, tablets/capsules typically contain 10 mg of active compound. In 2000, the estimated price of 2C-T-7 ranged 2–5 euro (about £1.4–3) per tablet (European Monitoring Centre for Drugs and Drug Addiction, 2004).

## The 2C-T-7 cyber market

Despite the paucity of both law enforcement and scientific reports regarding 2C-T-7 in the published literature, the situation is very different on the web, where information about this compound is 'just a click away' (Wax, 2002; Falck *et al.*, 2004). As a consequence, we aimed here at identifying and describing the information available online on 2C-T-7.

This survey, representing a special exercise of the Psychonaut 2002 Project (Schifano *et al.*, 2003), was carried out between October 2003 and January 2004. During this period, we searched the Internet with two of the most well-known search engines (i.e., Google™ and AltaVista™). To allow coverage of both the 2C-T-7 acronym and of its most usual street names (i.e., 'Blue Mystic'

and 'Tripstacy'), a selection of different keywords and combinations of keywords including '2C-T' and 'MDMA-like' was chosen. The term '2C-T-7' was matched with a variety of other terms (i.e., 'buy', 'rave', 'recipe' and 'shop') as well, in order to get information on the possibility of purchasing the compound online. The first 100 websites identified by Google™ and AltaVista™ with the '2CT-7' term were fully assessed and, whenever this was available, a further random sample of 10 links offered by Google™ and 10 by AltaVista™ (chosen among the first 100 between those identified with the use of each of the other keywords) were assessed as well. For those websites which were written in languages different from English, the assessment was carried out with the help of professionals fluent in that specific language.

Survey data included: website relevance; ranking; country of origin; website aims; website position towards drug use; purchase possibilities. Ranking referred to the numerical order of presentation in the results' list of the search engine. In taking into account the index website position towards drug use, four main categories were identified: Anti Drugs; Pro Drugs; Harm Reduction Approach; Not Stated. An Anti Drugs website typically advocated against the use of any drugs. Most usually, either prevention and/or treatment information was offered in these websites. On the other hand, Pro Drugs websites were actively promoting or facilitating the use of drugs. Typically, they provided information on how to synthesize, purchase or consume a variety of substances. Harm Reduction websites neither condemned nor promoted the use of drugs; they aimed instead at presenting evidence and facts, giving the surfers/readers the possibility of drawing their own conclusions. If a doubt was arising with respect to the categorization of a specific website, an agreement was sought between FS, PD and the researcher.

In following the methodology above described, 360 websites were identified and thoroughly assessed. Due to a degree of redundancy both within and between search engines, this initial sample was reduced to 174 websites. Eventually, whilst taking into account the relevance of the identified websites, a second screening was performed and those websites which were referring to issues different from drugs (i.e., music; movies, etc.) were eliminated. These procedures further reduced the sample to 118 websites.

The keywords which elicited the highest rates of relevant results were: '2C-T-7' (88% of relevant results); '2C-T-7 + rave' (80%); '2C-T-7 + recipe' (67%) and 'MDMA-like' (58%). On the other hand, neither the 'MDMA' nor the 'Blue Mystic' keywords elicited any relevant results.

For 17 websites (14.4%) it was impossible to identify their country of origin; 47 websites (39.8%) turned out to be originating from the USA, whilst 7 websites (5.9%) were originating from each of the following countries: the UK, Germany and Japan.

Most websites were providing either general information or news pertaining to 2C-T-7 and almost 30% of websites reported personal or others' accounts of 2C-T-7 intake experience. In 14 (11.9%) websites, the detailed description of the 2C-T-7 process of synthesis was given.

With respect to the overall position of websites towards the use of drugs (see Table 1), it appeared that 26% of them did not clearly state their view, 27% had a Pro Drugs approach while there was almost a similar rate of Anti Drugs (24%) and Harm Reduction Approach (23%) websites. According to the one-way ANOVA results, the website ranking number differed significantly as a function of the website position towards the use of drugs ($F(3, 114) = 4.52$, $p < 0.005$). The Tukey's HSD post hoc test revealed that Harm Reduction websites were ranking significantly lower than Anti Drugs ($p = 0.006$) and Not Stated ($p = 0.017$) websites.

**Table 1** Mean ranking values assigned by Google™ and AltaVista™ to sampled websites grouped according to their position towards drug use

| Website position towards drug use | Mean ranking values (SD) |
|---|---|
| Harm reduction (*) | 32.07 (29.098) |
| Pro drugs | 45.28 (26.599) |
| Anti drugs | 57.36 (30.146) |
| Not stated | 54.23 (26.732) |
| Total | 47.47 (29.327) |

*Tukey's HSD post hoc test significant values: Harm Reduction vs. Anti Drugs: $p = 0.006$; Harm Reduction vs. Not Stated: $p = 0.017$).

Finally, 5 (4.2%) websites were apparently offering the audience the possibility to purchase 2C-T-7, either through the use of a credit card or via a system which involved the use of e-mails.

## Discussion

The present report constitutes a systematic overview of both literature and online available multilingual information on 2C-T-7. This compound appears to be the most famous of a group of hallucinogenic phenethylamines that have psychoactive properties and side effects somewhat similar to other recreational drugs, such as MDMA ('ecstasy').

Only a few scientific reports have been published on 2C-T-7 and one of the suggestions from the present overview is that a web mapping of drug-related issues might be of interest for the practising clinician. However, much of the material quoted here referring to web based sources was not evidence-based and, for this reason, has proved to be difficult indeed to critically evaluate. The technical knowledge on new products entering the market, hardly obtained through reference books and scientific journals, is often held in closed groups of users, who exchange information with each other without any contact with the scientific world. To a certain extent, web browsing has become a sort of social system, which assembles people with similar interests and habits (Riva, 2001).

According to the survey results given here, 2C-T-7 was perceived on the web to be within the group of the MDMA-like substances, with almost 60% of relevant websites identified with this keyword. This seems to suggest the existence of similarities and/or of a certain degree of overlapping between the much larger

population of MDMA and that of 2C-T-7 users. On the other hand, many people are led to believe that alternative hallucinogenic phenethylamines, including 2C-T-7, are a form of 'legal' ecstasy or LSD (Drug Enforcement Administration, 2004).

A large quantity of personal advice and suggestions with respect to 2C-T-7 dosage, best ways of experimenting with its effects and avoiding untoward reactions was available in about 30% of the websites we sampled. The appeal of the Internet for those experimenting with hallucinogenic compounds (Falck *et al.*, 2004) can explain why, over the past few years, the psychoactive research chemical market has grown to the point that many of the vendors have been advertising on major search engines. We were able here to identify a number of websites offering 2C-T-7 for sale and it is of interest that the recent US drug enforcement 'Operation Web Tryp' found that products sold by the websites they identified were synthetic substances, including phenethylamines (Drug Enforcement Administration, 2004).

Falck *et al.* (2004) found that Harm Reduction websites were visited by four times as many users as government-sponsored websites by ecstasy users. Our findings seem to further shed light on this issue, since it appears that those websites which gave information and advice on how to best plan the drug intake experience (like the Harm Reduction and Pro Drugs websites) appeared earlier in the search engines' list than the governmental/prevention/Anti Drugs websites. In other words, information on 2C-T-7 of possible concern for at-risk and vulnerable users was more readily and promptly accessible on the web. Our findings seem to support the idea that projects aimed at designing more 'attractive', vigorously advertised, prevention websites should be implemented.

The large body of knowledge, albeit mostly anecdotal, which is offered online seems to contrast with the small numbers of seizures at street level, at least in the EU. One could wonder if lack of reported seizures is a convincing demonstration that the compound is not actually available. In our opinion this may be challenged, since the cyber and street markets may have different characteristics (Schifano *et al.*, 2003). The operational procedures of the law enforcement agencies, traditionally oriented to restricting the street market, might not be effective enough in monitoring the cyber market. The limited number of observed intoxications, whilst it may well be the consequence of the small amount of 2C-T-7 available, may be explained as well by either the inability of toxicologists to detect the abuse of substances of the 2C-series or by the unawareness of the phenomenon of these drugs.

One could argue that neither the online existence of lively discussion on 2C-T-7 nor its apparent purchase possibilities are, per se, a demonstration of its use. We did not survey here the actual *use* of the online information by interested web surfers, but only the availability and the content of data on 2C-T-7. On the other hand, it has been estimated that the hallucinogenic phenethylamines cyber market profits are possibly in the region of 20 000 US dollars per week (Drug Enforcement Administration, 2004). Future studies should better assess the characteristics of those consumers who take advantage of the online available information on hallucinogenic compounds; the stereotypical image of the 'drug misuser' may need to change (Littlejohn *et al.*, 2005).

## Contributions of authors

FS is the Psychonaut 2002 project grant holder and European coordinator who wrote the paper; PD is a senior researcher for the Psychonaut 2002 project, LA is a research assistant for the Psychonaut 2002 project and carried out the web search; GM is a Psychonaut 2002 collaborator and helped in the interpretation of the results; JC is an 'expert' for the UK Focal Point of the EMCDDA. All Authors had access to all data of the study.

### Acknowledgements

This paper has been supported by grant no. SPC 2002 306 (2002–2004) of the EU's DG – Public Health and Risk Assessment. The conclusion and interpretation of the findings of this study reflect the authors' views and the European Commission is not liable for any use that may be made of the information contained in this publication.

The following professionals helped in the assessment of websites written in languages different from English: Rik Bes, Aino Majava, Lisbet Harder, Sonya Toteva, Damien Robert, Holger Siemann, Pavel Kubů, Akiko Murakami, Soile Pietikäinen, Andrzej Wdowiak.

Information concerning seizures was provided by: Kajsa Mickelsson, Public Health Planning Officer, National Institute of Public Health, Stockholm; Roumen Sedefov, Synthetic Drugs and Scientific Committee, EMCDDA, Lisbon; Drugs Intelligence Unit, Forensic Science Service, Birmingham, England; National Criminal Intelligence Service, London; Guido Jossels, Wetenschappelijk Instituut Volksgezondheid, Afdeling Epidemiologie, Brussels.

### References

Aghajanian G K, Marek G J (1999) Serotonin and hallucinogens. Neuropsychopharmacol *21* (Suppl. 2): 16S–23S

Backstrom J R, Chang M S, Chu H, Niswender C M, Sanders-Bush E (1999) Agonist-directed signaling of serotonin 5-HT2C receptors: differences between serotonin and lysergic acid diethylamide (LSD). Neuropsychopharmacol *21* (Suppl. 2): 77S–81S

Balestrieri A, Fontanari D (1959) Acquired and cross tolerance to mescaline, LSD-25, and BOL-148. Arch Gen Psychiatry *1*: 279–282

Curtis B, Harty L, Kemp P, Choi C, Sneed G, Christensen D (2001) Preliminary investigation into identification and quantitation of 2,5-dimethoxy-n-propylthiophenethylamine a.k.a. 2C-T-7. Proceedings of the Fall meeting, Southwestern Association of Toxicologists, San Antonio. Available at: http://www.sat-tox.org/sanantonio.html. Accessed on 16 August 2004

Curtis B, Kemp P, Harty L, Choi C, Christensen D (2003) Postmortem identification and quantitation of 2,5-dimethoxy-4-n-propylthiophenethylamine using GC-MSD and GC-NPD. J Anal Toxicol *27*: 493–498

De Boer D, Bosman I (2004) A new trend in drugs-of-abuse; the 2C-series of phenethylamine designer drugs. Pharm World Sci *26*: 110–113

Drug Enforcement Administration (2004) DEA announces arrests of website operators selling illegal designer drugs. Available at: http://www.dea.gov/pubs/pressrel/pr072204.html. Accessed on 19 August 2004

European Monitoring Centre for Drugs and Drug Addiction (2004) Report on the risk assessment of 2C-I, 2C-T-2 and 2C-T-7 in the framework of the joint action on new synthetic drugs. Office for Official Publications of the European Communities, Luxembourg

Falck R S, Carlson R G, Wang J, Siegal H A (2004) Sources of information about MDMA (3,4-methylenedioxymethamphetamine): perceived accuracy, importance, and implications for prevention among young adult users. Drug Alcohol Depend *74*: 45–54

Gewirtz J C, Marek G J (2000) Behavioral evidence for interactions between a hallucinogenic drug and group II metabotropic glutamate receptors. Neuropsychopharmacol *23*: 569–576

Glennon R A (1990) Do classical hallucinogens act as 5-HT2 agonists or antagonists? Neuropsychopharmacol *3*: 509–517

Hardison C (2000) An amateur qualitative study of 48 2C-T-7 subjective bioassays. MAPS Bulletin *10*: 11

Khorana N, Pullagurla M R, Dukat M, Young R, Glennon R A (2004) Stimulus effects of three sulfur-containing psychoactive agents. Pharmacol Biochem Behav *78*: 821–826

Littlejohn C, Baldacchino A, Schifano F, Deluca P (2005) Internet pharmacies and online prescription drug sales: a cross-sectional study. Drug Educ Prev Policy *12*: 75–80

Marek G J, Aghajanian G K (1996) LSD and the phenethylamine hallucinogen DOI are potent partial agonists at 5-HT2A receptors on interneurons in rat piriform cortex. J Pharmacol Exp Ther *278*: 1373–1382

Murple (2001) Sulphurous Samadhi: An Investigation of 2C-T-2 and 2C-T-7. Available at: http://www.erowid.org/chemicals/2ct7/article1/article1.shtml. Accessed on 6 May 2004

Peyton III J, Shulgin A T (1994) Structure-activity relationships of the classic hallucinogens and their analogs. In: Lin G C, Glennon R A (eds), Hallucinogens: An Update. NIDA Research Monograph 146, National Institute on Drug Abuse, Rockville, MD, pp. 74–91

Riva G (2001) From real to virtual communities: cognition, knowledge and intention in the World Wide Web. In: Wolfe C R (ed.), Learning and Teaching on the World Wide Web. Academic Press, San Diego, CA

Sanders-Bush E, Burris K D, Knoth K (1988) Lysergic acid diethylamide and 2,5-dimethoxy-4-methylamphetamine are partial agonists at serotonin receptors linked to phosphoinositide hydrolysis. J Pharmacol Exp Ther *246*: 924–928

Schifano F, Leoni M, Martinotti G, Rawaf S, Rovetto F (2003) Importance of cyberspace for the assessment of the drug abuse market: preliminary results from the Psychonaut 2002 Project. Cyber Psychol Behav *6*: 405–410

Stolaroff M J, Wells C W (1993) Preliminary Results with New Psychoactive Agents 2C-T-2 and 2C-T-7. Yearbook Ethnomed, pp. 99–117

Titeler M, Lyon R A, Glennon R A (1988) Radioligand binding evidence implicates the brain 5-HT2 receptor as a site of action for LSD and phenylisopropylamine hallucinogens. Psychopharmacol (Berl) *94*: 213–216

Totse (2004) Available at: http://www.totse.com/en/drugs/psychedelics/164969.html. Accessed on 6 May 2004

Vollenweider F X (1998) Advances and pathophysiological models of hallucinogenic drug actions in humans: a preamble to schizophrenia research. Pharmacopsychiat *31* (Suppl. 2): 92–103

Vorce S P, Sklerov J H (2004) A general screening and confirmation approach to the analysis of designer tryptamines and phenethylamines in blood and urine using GC-EI-MS and HPLC-electrospray-MS. Anal Toxicol *28*: 407–410

Wax P (2002) Just a click away: recreational drug web sites on the Internet. Pediatr *109*: 96–100