

## REVIEW

# THE LUNG EFFECTS OF ILLICIT DRUGS

**Crista Laslo<sup>1</sup>, Beatrice G. Ioan<sup>2</sup>, Ovidiu G. Bratu<sup>3,4</sup>, Bogdan Socea<sup>3,5</sup>, Camelia Diaconu<sup>4,3</sup>**

<sup>1</sup>Clinical Emergency Hospital of Bucharest, Romania

<sup>2</sup>Department of Legal Medicine, „Grigore T. Popa“ University of Medicine and Pharmacy, Institute of Legal Medicine, Iași, Romania

<sup>3</sup>„Carol Davila“ University of Medicine and Pharmacy, Bucharest, Romania

<sup>4</sup>Emergency University Central Military Hospital, Bucharest, Romania

<sup>5</sup>Emergency Clinical Hospital “Sfântul Pantelimon”, Bucharest, Romania

### ABSTRACT

Illicit drugs use is a real public health issue, especially among young people. The totality of the drugs harmful effects on the body is difficult to quantify, especially because of poor epidemiological data and ethical concerns about the inclusion of consumers in clinical trials. However, health professionals need to be alert to identify, report and fight drug-related pathology. This article aims to draw attention to the lung pathology induced by the consumption of some of the most commonly used illicit drugs: cocaine, heroin and cannabis.

**Key words:** cocaine, heroin, cannabis, pulmonary disease.

### RÉSUMÉ

**Les effets nocifs de l'usage de drogues illicites sur les poumons**

L'usage de drogues illicites est un véritable problème de santé publique, en particulier chez les jeunes. La totalité des effets nocifs des médicaments sur le corps est difficile à quantifier, notamment en raison de données épidémiologiques médiocres et de préoccupations éthiques concernant l'inclusion des consommateurs dans les essais cliniques. Cependant, les professionnels de la santé doivent être vigilants pour identifier, signaler et combattre les pathologies liées à la drogue. Cet article vise à attirer l'attention sur la pathologie pulmonaire induite par la consommation de certaines des drogues illicites les plus couramment consommées: la cocaïne, l'héroïne et le cannabis.

**Mots-clés:** cocaïne, héroïne, cannabis, maladie pulmonaire.

---

Corresponding author:

Camelia Diaconu  
Internal Medicine Clinic, Clinical Emergency Hospital of Bucharest  
8 Calea Floreasca, Bucharest, Romania  
e-mail: drcameliadiaconu@gmail.com

## INTRODUCTION

The effects of illicit drugs on the human health and the impact on society are a real public health problem, difficult to quantify and manage. Epidemiological data regarding illicit drugs users is poor, the real number of illegal drug users being hard to identify, because of the psychological profile of the drug user and reluctance to recognize consumption, due to possible legal consequences and social marginalization. In addition, the involvement of illicit drugs users in clinical trials raises ethical issues.

The most commonly used illicit drugs, which are also subjects of the European drug reports, are opioids, cocaine, amphetamines, cannabis (marijuana) and MDMA (methylenedioxyamphetamine, also known as „Ecstasy“). According to the latest European report, the most commonly used drug is cannabis<sup>1</sup>. In the European Union, 26.3% of adults aged 15-64 years have consumed cannabis at least once in their life, most of them being in the 15-34 years age group. In decreasing order of drug use, cocaine (5.2%), MDMA (4.2%) and amphetamines (3.8%) follow cannabis<sup>1</sup>. In Romania, epidemiological data refer to young adults aged 15-34 years, who used drugs in the last year. Similar to European Union data, the most used illicit drug in Romania is cannabis, with 3.3% users, followed by MDMA, cocaine and amphetamines (<1%)<sup>2</sup>. A particular problem is the consumption of opioids, which, although having a lower prevalence compared to other drugs, generates many health issues and is the cause of 81% of cases of fatal overdose at European level<sup>1</sup>.

The medical consequences of drug use depend on the substance used, the route of administration, the frequency and the dosage. In case of inhalation, many types of pulmonary damage may occur. Intravenous users have a high risk of transmission of viral infections due to human immunodeficiency virus (HIV) or hepatitis B and C viruses. Psychological and physical dependence is encountered in the consumers of all type of illicit drugs.

Psychological dependence is triggered by the pleasant, euphoric sensation induced by the drug or the anxiolytic properties of the substance. Anticipation of these feelings leads to the installation of „craving“, to the compulsive desire to obtain and use the drug, with important consequences for the individual's behavior and social life. Drugs that produce an important psychological addiction are: cannabis, amphetamines and MDMA. Physical dependence is marked by the appearance of abstinence syndrome, the drugs that induce a strong physical dependence being heroin, alcohol and cocaine<sup>3</sup>.

Consumption of illicit drugs is associated not only with psychological effects, but also with the occurrence of serious systemic complications, including pulmonary complications. Consumption of illicit drugs may be associated with important pulmonary effects related to either lung parenchyma, pleura, respiratory airways, pulmonary vascularisation or mediastinum. Pulmonary manifestations due to drug usage have no clinical or paraclinical pathognomonic features. Their diagnosis is one of exclusion. Pulmonary involvement in drug users can lead to the following syndromes<sup>4</sup>:

- hypersensitivity reactions;
- cryptogenic pulmonary edema;
- capillary leak syndrome;
- pulmonary vascular damage;
- interstitial pneumonia;
- bronchospasm;
- pleural effusions;
- mediastinal disorder.

## COCAINE

Cocaine is found in the form of a crystalline salt (cocaine hydrochloride) and can be consumed either by snorting or by dissolving it in water and injecting intravenously, or can be found in the free form after extraction of the cocaine base („free-base cocaine“, „crack“). This pure form is volatile and is consumed through inhalation of vapors by means of a special pipe, the effect getting installed much faster, with amplified intensity<sup>3</sup>.

The pulmonary effects of cocaine use are directly related to the way the drug is administered. Snorting of cocaine powder can lead to ischemia or even necrosis of the nasal mucosa and respiratory sinuses<sup>5</sup>. The most common respiratory symptom is the productive cough with dark brown sputum, which occurs approximately 1-12 hours after snorting cocaine powder. Other common symptoms are chest pain, hemoptysis, rarely bronchospasm, dyspnoea or wheezing. Rarely, pneumothorax or pneumomediastinum may occur, which are secondary to excessive inhalation of cocaine powder<sup>6</sup>.

Pulmonary involvement is more common with crack cocaine intake. „Crack Lung“ is the name attributed to acute pulmonary damage resulting from cocaine use, characterized by a bilateral pulmonary condensation syndrome. The chest radiography can not distinguish between the various causes of the syndrome: alveolar haemorrhage, pulmonary edema, eosinophilic pneumonitis or opportunistic infections<sup>7,8</sup>. Alveolar haemorrhage has been frequently identified in cocaine users, often with a favorable evolution, with spontaneous and rapid remission following cessation of drug use<sup>6,9</sup>.

A type of pulmonary disease less frequent, but associated with cocaine use, is eosinophilic pneumonitis<sup>10</sup>, which is similar to a hypersensitivity reaction, it associates blood eosinophilia and may be recurrent if future cocaine use. The radiological findings are not specific. Bronchoscopy with bronchoalveolar lavage and bronchial mucosa biopsy reveals the typical aspect of eosinophilic pneumonitis<sup>11,12</sup>. The reported cases either had spontaneous resolution or responded favorably to corticosteroid therapy<sup>13</sup>.

Cocaine use may also be associated with exacerbation of bronchial asthma, cardiogenic pulmonary edema, interstitial pneumonia, pulmonary hypertension, or altered pulmonary diffusion<sup>6,14</sup>.

## HEROIN

Heroin is a semisynthetic drug, derived from morphine, and is part of the opiate class. Although all drugs in this class are readily absorbed in both digestive tract and lung, heroin produces the most intense and rapid effects following intravenous administration, which is also the most common route of administration. Illegally sold heroin contains only 5-10% active substance, the rest consisting of other substances such as lactose, milk powder, caffeine, paracetamol and others<sup>15</sup>.

A relatively common manifestation associated with heroin use is non-cardiogenic acute pulmonary edema<sup>8</sup>. The main mechanism is increased capillary permeability, followed by alveolar fluid extravasation, a mechanism which can be doubled by a neurogenic mechanism secondary to central nervous depression due to heroin use<sup>16</sup>.

The route of administration and the conditions in which heroin is consumed (use of non-sterile syringes or sharing of the same syringe) may cause infectious endocarditis of the right heart, with pulmonary embolism<sup>17</sup>. Repeated septic emboli may be the cause of abnormalities of pulmonary vascularisation and of the occurrence of pulmonary hypertension<sup>8,18</sup>.

## CANNABIS

Cannabis (or Marijuana) is the most commonly consumed illicit drug, in some countries being at the limit between legal and illegal. There is little data to confirm the development of physical dependence, but regular and long-term cannabis consumption can induce psychological dependence. Cannabis can be consumed both orally or by cigarette smoking, but the effect is faster if inhaled, inhalation being the most common form of consumption<sup>3</sup>. The illicit use of cannabis is a controversial subject, as it is difficult to determine whether the negative effects of this drug on the body outweigh the positive ones.

Unlike tobacco consumption, which causes bronchoconstriction, cannabis induces a significant bronchodilation of up to 2 hours and amelioration of symptoms in people with asthma<sup>19</sup>. This may be clearly beneficial for asthma patients, but the positive bronchodilator effect should be balanced against the harmful effects of chronic cannabis use. Like tobacco smoking, inhaled cannabis consumption produces injuries to the bronchial epithelium, reduces the number of ciliated cells<sup>20</sup> and thus predisposes the lung to recurrent bronchitis, which may be the starting point for asthmatic exacerbations<sup>21</sup>.

Cannabis has been tried for medical purposes, to combat nausea and vomiting associated with chemotherapy in cancer patients<sup>3,22</sup>. The effectiveness of cannabis use in this situation is inferior to standard drug treatment, but superior to placebo. Despite the modest beneficial effect observed, contamination of the cannabis cigarette with different bacteria or fungi in the context of an immunosuppressed organism can lead to serious lung infections, a fatal form of pulmonary aspergillosis being associated with cannabis use in this situation<sup>8,23</sup>.

In addition, the presence of pulmonary emphysema has been detected in cannabis smokers and can be complicated by the development of pneumothorax or pneumomediastinum<sup>9</sup>. However, it is difficult to determine whether emphysema is a direct consequence of cannabis use, as most consumers are also tobacco smokers.

At present, there is still insufficient data to prove harmful effects of cannabis, but chronic cannabis users develop cough with expectoration and have acute bronchitis episodes<sup>3,24</sup>. Another extremely important aspect, although not yet demonstrated, is related to lung cancer. Data from the medical literature are contradictory, some studies showing an association between lung cancer and cannabis use, others studies being inconclusive<sup>12</sup>. However, following the development of endobronchial biopsies in cannabis smokers, numerous changes in the tracheobronchial epithelium have been identified, including areas with basal layer hyperplasia or squamous metaplasia zones<sup>25</sup>, which may be the starting point of a lung cancer.

## CONCLUSIONS

In conclusion, given the many possible consequences of lung-related drugs, the pulmonary evaluation of any patient known to be a illicit drug user is extremely important. In addition, the following aspects should be taken into account: the real number of illicit drug users probably is much higher than the official one and the patients can deny the usage, leading to underdiagnosis or misinterpretation of the

clinical context. Therefore, a higher degree of clinical suspicion is required.

#### Compliance with Ethics Requirements:

„The authors declare no conflict of interest regarding this article“

„The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law.“

#### REFERENCES

1. Observatorul European pentru Droguri și Toxicomanie. Raportul european privind drogurile 2017: Tendințe și evoluții, Oficiul pentru Publicații al Uniunii Europene, Luxemburg. <http://www.emcdda.europa.eu/system/files/publications/4541/TDAT17001RON.pdf> (Accessed January 02, 2018)
2. European Monitoring Centre for Drugs and Drug Addiction (2017), Romania, Country Drug Report 2017, Publications Office of the European Union, Luxembourg. (<http://www.emcdda.europa.eu/system/files/publications/4507/TD0116919ENN.pdf>) (Accessed January 02, 2018)
3. Beers MH, Porter RS. Utilizarea și dependența de droguri. Manualul Merck de diagnostic și tratament, 18th ed, Adriana Mușar et al, București, editura All, 2009: 1683-1700.
4. Diaconu C. Complicațiile pulmonare ale consumului de droguri interzise. În „De la simptom la diagnostic în practica medicală“, Camelia Diaconu. Editura ALL, București, 2016. ISBN 978-606-587-405-3
5. Blaise G, Vanhooteghem O, De La Brassinne M. Perforation of the nasal septum in cocaine abusers. *Rev Med Liege* 2005;60:845-8.
6. Benson MK, Bentley AM. Lung disease induced by drug addiction. *Thorax* 1995;50:1125-7.
7. Paraschiv B, Diaconu C. Radiografia toracică. În „Explorări funcționale în medicina internă“, Camelia Diaconu. Editura ALL, București, 2016. ISBN 978-606-587-417-6.
8. Nguyen ET, Silva C, Isabela S, Souza CA, Müller NL. Pulmonary complications of illicit drug use: differential diagnosis based on CT findings. *Journal of Thoracic Imaging*, 2007, 22 (2):199-206.
9. Gotway MB, Marder SR, Hanks DK, et al. Thoracic complications of illicit drug use: an organ system approach. Radiographics: a review. *Radiological Society of North America*, Inc 22 Spec No: S119-135, 2002.
10. Forrester JM, Steele AW, Waldron JA, Parsons PE. Crack lung: an acute pulmonary syndrome with a spectrum of clinical and histopathological findings. *Am Rev Resp Dis* 1990; 142:462-7.
11. Paraschiv B, Diaconu C. Fibrobronhoscopia. În „Explorări funcționale în medicina internă“, Camelia Diaconu. Editura ALL, București, 2016. ISBN 978-606-587-417-6.
12. Kolbe MS. Beyond Crack Lung. A case of acute eosinophilic pneumonia after crack cocaine use [abstract]. *Journal of Hospital Medicine*. 2016; 11 (suppl 1). <http://www.shma-abstracts.com/abstract/beyond-crack-lung-a-case-of-acute-eosinophilic-pneumonia-after-crack-cocaine-use/>. (Accessed January 02, 2018)
13. Kissner DG, Lawrence WD, Seles JE, Flint A. Crack lung: pulmonary disease caused by cocaine abuse. *Am Rev Respir Dis* 1987;136:1250-2.
14. Hoffman CK, Goodman PC. Pulmonary edema in cocaine smokers. *Radiology*. 1989;172:463-465.
15. Shukit MA, Segal DS, Mendelson JH, Mello NK. Alcoholism and drug dependency, Harrison's principles of internal medicine, 11th ed, Eugene Braunwald et al.(eds). New York: McGraw Hill Education, 1987: 2111-2117.
16. Proudfoot A, Vale A. Substance abuse: features and acute management. *Medicine* 1995;23:71-6.
17. McCarroll KA, Roszler MH. Lung disorders due to drug abuse. *J Thorac Imaging* 1991; 6:30-35.
18. Antonelli-Incalzi R, Ludovico Maini C, Giuliano Bonetti M, Campioni P, Pistelli R, Fuso L. Inapparent pulmonary vascular disease in an ex-heroin user. *Clin Nucl Med* 1986;11:266-9.
19. Tashkin DP. Effects of marijuana smoking on the lung. *Ann Am Thorac Soc*. 2013;10(3):239-47.
20. Howden ML, Naughton MT. Pulmonary effects of marijuana inhalation. *Expert Rev. Resp. Med*. 2011, 5(1):87-92.
21. Wu T, Tashkin DP, Djahed B, Rose JE. Pulmonary hazards of smoking marijuana as compared with tobacco. *N Engl J Med* 1988;18:347-51.
22. Tramèr MR, Carroll D, Campbell FA, Reynolds DJM, Moore RA, McQuay HJ. Cannabinoids for control of chemotherapy induced nausea and vomiting: quantitative systematic review. *BMJ: British Medical Journal*. 2001;323(7303):16.
23. Sutton S, Lum BL, Torti FM. Possible risk of invasive pulmonary aspergillous with marijuana use during chemotherapy for small cell lung cancer. *Drug Intell Clin Pharmacol* 1986;20:289-91.
24. Gong H, Fligiel S, Tashkin DP, Barbers RG. Tracheobronchial changes in habitual heavy smokers of marijuana with and without tobacco. *Am Rev Resp Dis* 1987;136:142-9.
25. Fligiel SEG, Roth MD, Kleerup EC, Barsky SH, Simmons MS, Tashkin DP. Tracheobronchial histopathology in habitual smokers of cocaine, marijuana, and/or tobacco. *Chest* 1997, 112(2):319-326.