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The conventional and non conventional emergencies is a macro definition including all the events that can affect, directly or indirectly, the safety and the security at local, regional, national or international levels. The Covid-19 pandemic situation such as the Spanish flu, the Chernobyl accident such as the Fukushima's one, the chemical attack in Ypres such as the subway release of Sarin in the subway in Tokyo are just few examples representing some of the historical recurrences that can be classified as natural, accidental, intentional or war related events or as biological, radiological/nuclear, chemical events. There are many aspects to consider in order to face those events and the related consequences: experts and technologies availabilities, national and international intervention and cooperation plans, prevention plans, education and training programs, research projects, emergency management plans, communication systems, recovery of normality, logistic, economical and legal aspects, business continuity and so on. It is indubitable that an emergency involves, directly or indirectly, the entire society. This is why this scientific & editorial project wants to collect all the aspects related to the emergency, «CBRNe & Beyond» has the purpose to be a point of convergence of expertise, experiences and lessons learned to improve safety and security worldwide in order to reach the recovery of normality after an event.

CBRNe & Beyond

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Future anti-terrorism and public health CBRNe scenarios

A comprehensive guide of central nervous system-active substances and precursors, their impact on the Chemical Weapon convention inspection regime and international security

Foreword by Matteo Guidotti

UNIVERSITÀ

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Table of Contents

- p. 11 Foreword by Matteo Guidotti
- 15 Notes for the Reader
- 17 Introduction

- 23 Chapter 1
 - CNS-active Substances*
 - Analgesics, 34
 - Morphine, 36
 - Codeine, 39
 - Fentanyl, 40
 - Methadone, 43
 - Comparison of potency among different opioids, 45
 - Naloxone, 47
 - Antiepileptics, 48
 - Phenobarbital, 50
 - Vigabatrin, 52
 - Levetiracetam, 53
 - Antidepressant and anxiolytics, 55
 - Fluoxetine, 58

	Imipramine, 60
	Diazepam, 61
	Antipsychotics, 63
	Chlorpromazine, 66
	Olanzapine, 68
	Hypnotics and sedatives, 70
	Zolpidem, 72
	General anesthetics, 74
	Halothane, 77
	Enflurane, 78
	Propofol, 79
	References, 81
p. 83	Chapter 2
	<i>OPCW'S Inspection Regime</i>
	Inspection rules overview, 90
	References, 93
95	Chapter 3
	<i>Central Nervous System (CNS) Active Substances Synthesis and Precursors</i>
	The nervous system, 95
	The synthetic strategies and their analysis, 98
	Conclusions, 130
	References, 132
137	Chapter 4
	<i>Sampling and Analysis</i>
	Introduction, 137
	Sampling, 141

Sampling Preparation, 148

Analysis, 154

References, 176

p. 177 Acknowledgments

Foreword

Omnia venenum sunt: nec sine veneno quicquam existit. Dosis sola facit, ut venenum non fit.

Everything is poison: nothing exists that is not poisonous. Only the dose prevents the poison from taking effect.

Philippus Aureolus Theophrastus
Bombastus von Hohenheim,
sive Paracelsus, 1493-1541

The discovery and the use of bioactive substances and active ingredients marked, since ancient times, the beginning of modern pharmacology and chemotherapy. Later, the cautious use of either natural or synthetic molecules active on the central nervous system paved the way to the growth of modern medicine. In the early decades of 20th century, the rapid and impressive flourishing of anesthesiology, surgery, pain management therapies and of a plethora of medicines modulating and controlling most of our bodily functions is directly related to the restless development of organic chemistry techniques that led to the isolation or modification of bioactive natural products as well as to the synthesis of completely new bioactive agents. Such advances in medicine, pharmacy and chemistry allowed humankind to extend lifetime expectation and improve life quality to levels that were simply unpredictable for our ancestors.

Nevertheless, central nervous system-active substances are also among the most representative examples of dual-use chemicals. Their extraordinary capability to “switch off” feelings, consciousness, pain and, ultimately, life makes this broad family of bioactive molecules a multi-faceted tool: a resource worth exploiting in life sciences and medicine or a threat for their potential use as illicit drugs for recreational purposes or as unconventional weapons in criminal, sabotage or warfare acts. In many cases, the boundary between a safe and lawful application of these substances and a dangerous use of them is narrow and even blurred. Incapacitating chemicals considered safe under carefully monitored pharmaceutical conditions can display very low safety margins when used in far less controlled environments, such as for law-enforcement and riot-control purposes. Central nervous system-acting chemicals can indeed cause death, temporary incapacitation or permanent harm during or even long time after exposure, thus raising a broad concern across the scientific community about the misuse of these molecules for illegal scopes.

International humanitarian law, through the Chemical Weapons Convention signed in 1993, has banned the development, possession and use of weaponized toxic chemicals. However, only very recently, in December 2021, the Conference of States Parties at the Organisation for Prohibition of Chemical Weapons extended the ban to the use of central nervous system-active substances in aerosolized form, even for law enforcement purposes. These compounds, in fact, are to be considered as toxic chemicals, not riot control agents, since some of them are as lethal as nerve agents and their dose cannot be absolutely controlled in aerosol form.

In addition, for none of them a sufficient margin of safety has been identified so far.

It is therefore important for scientists, academic or industrial researchers, experts in organic and pharmaceutical chemistry to know more about the properties of this class of psychotropic molecules and get acquainted with their physico-chemical characteristics, physiological, toxicological and pathological effects on the organism, therapeutic use as well as with the synthetic pathways to obtain them and the analytical methods to sample, detect and quantify them.

Likewise, it is worth highlighting that the present text shows an added value with respect to many other works which previously described chemical, pharmaceutical and medical characteristics of central nervous system-active compounds: it merges technical data from updated literature sources with convenient information about the current legal framework of the Chemical Weapons Convention under which these bioactive molecules are monitored, controlled and regulated. It is uncommon to find these features enclosed in only one text, as scientists are seldom keen to deal with ethical and regulatory issues linked to poisonous molecules, while, on the contrary, experts in international humanitarian law and policies are often not familiar with all technical aspects related to the synthesis, analysis and therapeutic use of such chemicals.

Considering that vulnerability of society frequently stems from a sense of fear of the unknown, the present text, shedding light onto a broad series of powerful dual-use chemicals, can therefore be considered as a good “antidote to fear” and ultimately a practical multidisciplinary resource for technical experts and professionals working in the field

of prevention, protection and response to accidents and criminal acts caused by a wrong, unsafe and unethical use of Chemistry.

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Notes for the Reader

This book is the result of a study conducted by Claudio Calace Salvemini and Damiano G. Ferrari, whose biographies are included in the text. Both authors are experts in pharmacology, toxicology, organic chemistry/biochemistry, and CBRNe safety and security.

This book serves as an excerpt from a study previously commissioned by the Italian Navy Commander (NATO: OF-4) Gaetano Carminati in 2020. At that time, Commander Carminati was employed with the Italian Disarmament and Arms Control Office, a branch of the Italian Ministry of Foreign Affairs and International Cooperation. The study was also commissioned by the academic board of the University of Tor Vergata in Rome, under the supervision of Professor D. Di Giovanni.

The assigned study aimed to develop a technical-scientific examination of certain substances, and especially of their precursors, not yet included at that time in the inspection tables of the Convention for Chemical Disarmament (CWC), which could therefore constitute a twofold use risk.

Concurrently, the study goal was to raise awareness within the scientific community, regarding the potential dou-

ble use of CNS active substances and the impact that their scheduling under the convention (CWC) would have on the inspection regime of the OPCW.

However, in 2021 the OPCW significantly enhanced the power of the CWC, by declaring all aerosolized CNS active substances prohibited. This proactive measure represents a substantial effort by the OPCW to prevent a twofold use of these chemicals.

In this work, the authors consider various pharmaceutical syntheses and meticulously evaluate each one to determine whether and how any scheduled chemicals are utilized. After thorough analysis, it has been determined that the majority of syntheses do not employ such chemicals. However, a few syntheses currently use thionyl chloride (CWC schedule 3). The misuse of drugs that affect the CNS is a growing concern among authorities. The OPCW is currently assessing the possibility of adding all CNS active substances to its list. The potential impact of this decision on the inspection regime is further discussed in this book.

The authors emphasize that all data, tables, and the entire content of the book are derived from unclassified documents and are the result of open-source research. They also declare that they have no known competing financial interests or personal relationships that could have influenced the work presented in this book.

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- #2 Luigi Palestini, *Emergenze: i sistemi di comunicazione e di supporto alle decisioni. Le nuove tecnologie per soccorso, comando e controllo: l'esperienza del Corpo nazionale dei Vigili del Fuoco*