

## Incapacitating agents: weapons of mass disruption

### 癱瘓性毒劑：大破壞力武器

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Terrorism, and with it the possibility of hostage taking and sieges, has become a common feature of our times. The gas used to subdue terrorists in Moscow on 26 October 2002, which appeared to be responsible for the deaths of 123 of the 127 hostages killed in the crisis, remains unknown. Much criticism was levelled at the Russian security forces following the rescue of hostages for not revealing the exact agent used. This paper asks the questions: how deeply should doctors be drawn into the non-medical use of drugs and the unorthodox use of medical knowledge, and how can they help to predict and plan responses to misuse by others? (*Hong Kong j.emerg.med.* 2005;12:182-184)

因恐怖活動而可能導致扣押人質事件已成為現今社會一個常見的特色。在2002年10月26日莫斯科劇院的危機中，用以征服恐怖份子的毒氣至今仍是一個謎。在127名扣押的人質中，123名極有可能是因該毒氣而死亡。在拯救人質後，雖然俄國保安部隊受到很多批評，但一直沒有確切地透露所用的毒劑。這篇文章反思以下的問題：癱瘓性毒劑在非醫學及非正統用途上，醫生應參與的程度是多少？醫生們應如何幫助預防該毒劑所引發的事故及協助策劃應變計劃？

**Keywords:** Chemical riot control agents, formal social control, police, terrorism

**關鍵詞：**化學防暴劑、正規的社會控制、警察、恐怖主義

## Introduction

The idea of submitting this article is to alert doctors working in emergency departments to the possibility of encountering a new type of chemical exposure: the effects of incapacitating agents. We have used the term Weapons of Mass Disruption, which is descriptive of the use of supposedly non-lethal chemical agents to cause incapacitation among large numbers of people. The United States does not classify incapacitating agents as

Chemical Warfare Agents (CWA), and internationally there is a grey area occupied by these new weapons, that both law enforcement agencies and terrorists would utilise. Traditional riot control agents will become outdated.

No third parties know the exact nature of the gases that were used in the Moscow Theatre siege. In this paper, information was gathered from newspapers, research on animal models, textbooks, journals and the minimal known facts gathered from the surviving victims. With these observations and together with our existing knowledge, it was likely that the gases used were a mixture of at least carfentanil and halothane. Many chemical agents previously used for life saving may be turned into weapons of mass disruption, and there is on-going argument about the legal use of such agents in law enforcement.

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## Definition of incapacitating agents

Incapacitating agents include any drug, chemical or biological entity capable of impairing the ability of humans or animals to function normally, whether at work or in the pursuit of activities of daily living, in a temporary and non-lethal manner. In the past, the development and manufacture of such agents has largely been confined to organised governments, as has their regulation by treaty and their decommissioning.<sup>1</sup> Due to the vast number and scope of possible agents, the potential for abuse by rogue governments, terrorist groups and criminals, physicians must remain alert to emerging threats.

## The Moscow Theatre siege, 2002

The gas used to subdue terrorists in Moscow on 26 October 2002, which appeared to be responsible for the deaths of 123 of the 127 hostages killed in the crisis, remains unknown. However, some hints could be obtained by scientific experts based on eyewitness reports, observations of physicians who treated the stricken hostages, the condition of the patients, statements by Russian officials and several laboratory tests performed on survivors. According to the Washington Post dated 9 November 2002, two Moscow physicians said that many patients had classic signs of opioid intoxication such as pinpoint pupils, unconsciousness, depressed breathing and cyanosis. Moreover, all hostages treated at their hospital were given naloxone, and all responded. Furthermore, the Russian health minister, Yuri Shevchenko, said that the gas contained "derivatives" of fentanyl, a compound that is similar to morphine but about 80 times more potent. Nevertheless, the name of this derivative was not disclosed.

It was postulated that this gas was an aerosol form of fentanyl – "carfentanil". Carfentanil is a fentanyl derivative marketed under the trade name Wildnil. It is 8,000-10,000 times more potent than morphine and has an unusually wide safety margin, and for this reason it may have been considered an agent of choice to incapacitate hundreds of people in a large architectural space. Carfentanil cannot be detected by ordinary tests for fentanyl and this may explain why no trace of fentanyl could be detected in two surviving German hostages.

However, traces of halothane were detected in the blood of these two survivors at about 36 hours after their rescue. The presence of halothane in the Russian gas mixture could explain why some unconscious patients were not fully revived with naloxone. Halothane has a narrow safety margin thus making it exceptionally dangerous as a tool for crowd control.

## Efficiency and safety considerations

In pharmacology, the Therapeutic Index (TI) refers to the ratio of median lethal dose to median effective dose (i.e. incapacitation). Incapacitation when used in a general sense is roughly equivalent to the term "disability" as used in occupational medicine and denotes the inability to accomplish a military or tactical mission because of a quantifiable physical or psychobehavioural impairment (US Army Medical Research Institute of Chemical Defence). The TI of carfentanil in rats is 10,000, meaning that a lethal dose is about 10,000 times greater than the dose required to relieve pain. Carfentanil's safety margin might account for the reaction of Russian officials who expressed amazement at the fatalities. Sufentanil, another derivative of fentanyl, has a TI of 25,000, making it safer than carfentanil. However, it is only about 50% as potent as carfentanil and therefore a large volume would be required to produce the same effect. In contrast, halothane has a therapeutic index of 3, meaning that a lethal dose is only 3 times that required to anaesthetise a patient.

The deployment of an air-borne fentanyl derivative as an incapacitating agent to end the Moscow Theatre siege perhaps represents the ultimate off-label use of an opiate.<sup>2</sup> Much criticism was levelled at the Russian security forces following the rescue of hostages for not revealing the exact agent used, although it appeared that medical staff were told of the need to use naloxone to treat the casualties. Whether more could have been done to assist the emergency services to prepare is still unclear. The use of opiate as an incapacitating agent was a surprise to the World but it is not novel, and both carfentanil and sufentanil have also been listed in this role in the recent past.<sup>3</sup> Historically, the mass debilitating effects of opium smoking on working populations have been known for centuries, and led China into two wars with Britain in the period 1839-1858.<sup>4</sup>

## Ethical considerations

How deeply should doctors be drawn into the non-medical use of drugs and the unorthodox use of medical knowledge in general? It is certain that doctors have been asked to give advice of this sort in the past - during the Iranian embassy siege in London in 1980, the Metropolitan Police commander sought information on the feasibility of treating food sent into the embassy with a preparation to make the inhabitants ill.<sup>5</sup> The idea was abandoned at the time as impractical, a sensible conclusion in view of the unpredictability of action of common drugs, chemicals and biological agents.

Terrorism, and with it the possibility of hostage taking and sieges, has become a common feature of our times. Recently, the emergence of groups willing to resort to suicide and the mass murder of hostages has reactivated debate about the legal use of incapacitating agents. There are substantial grey areas lying between the concept of crowd control agents at one end of a spectrum, military incapacitating agents in the middle, and lethal chemical weapons at the other. The Chemical Weapons Convention of 1994<sup>1</sup> banned all agents designed to cause death, temporary incapacitation or permanent harm to humans or animals, but allows for the use of chemical agents in riot control and for other law enforcement activities. Agents weaponised for military use in the past have included LSD [lysergic acid diethylamide] (having hallucinogenic effects), BZ [3-quinuclidinyl benzilate] (anticholinergic effects),<sup>6</sup> and opiates. Riot control agents such as CN [chloroacetophenone], CS [chlorobenzylidenemalononitrile] and chlorpicrin are classified separately and many are still in current use.<sup>7</sup> Possible terrorist use of incapacitating agents has received little attention, apart from considerations of a need for public health surveillance to detect biological attack.

Large amounts of the riot-control agent CS were used in Hong Kong in 1989 for the control of disorder in the Vietnamese boat people detention camps. Whitehead and High Island detention centres were opened in 1989 to accommodate the large number of Vietnamese boat people entering Hong Kong.<sup>8</sup> At that time there were about 22,000 boat people housed in Whitehead and 7,200 remaining in High Island, all waiting for either Voluntary or Orderly Repatriation back to Vietnam.

However, they were not happy about the arrangement and rioting was not uncommon. Many victims suffering from CS exposure were brought to the Accident and Emergency Department of Prince of Wales Hospital for treatment. However, the effect of CS was only temporary and no permanent disability was reported.

## Conclusion

The concept of using medical knowledge for anything other than the benefit of mankind is distasteful. The Hippocratic oath forbids the use of the medical "art" to do harm, yet without a detailed knowledge of how others might perpetrate such an abuse, physicians may be powerless to combat the threat. It is certain that governments hold substantial research data on non-medical uses of chemical and biological agents, gathered in the past before such weapons were outlawed.<sup>1</sup> Without giving away sensitive information about delivery systems, this data could be made available to ensure that emergency services are ready for the effects of terrorism itself and indeed for the sort of novel response to terrorism employed in Moscow.

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