DOWN THE SLIPPERY SLOPE? A STUDY OF CONTEMPORARY DUAL-USE CHEMICAL AND LIFE SCIENCE RESEARCH POTENTIALLY APPLICABLE TO INCAPACITATING CHEMICAL AGENT WEAPONS

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EXECUTIVE SUMMARY

Certain lines of contemporary research into a range of pharmaceutical chemicals could potentially be – rightly or wrongly - construed as being linked to the study or development of incapacitating chemical agents (ICAs) with weapons utility. This report highlights some specific areas where such concerns or mis-perceptions might arise. Further to this, the report also explores how States can ensure that such research is not utilised in chemical weapons development, or misinterpreted as being utilised for such purposes.

The report incorporates case studies, based on a standardised methodology. These case studies draw upon information derived primarily from documents in English. The case studies describe a variety of different scenarios in which research, potentially applicable to ICA weapons has reportedly occurred, or where such weapons have reportedly been developed or used since the coming into force of the Chemical Weapons Convention (CWC) in 1997[1]. The following States are discussed as case studies:

China: ICA weapons employing an unknown anaesthetic agent for use against individuals have been developed and marketed by Chinese companies at international arms fairs held in China, and in 2012 were reportedly held by the Chinese People's Liberation Army. China has provided no public information regarding its stockpiles of these weapons nor the specific purposes of their intended employment. To date, China has made no statement clarifying whether any Chinese entity has conducted or is conducting research activities related to the development of ICA weapons targeting groups of individuals.

Czech Republic: From 2005-2007, Czech scientists published papers describing their investigations over several years relating to a range of pharmaceutical chemicals including various opioids, ketamine, medetomidine and midazolam, specifically highlighting their potential utility as, in their words, *"pharmacological non-lethal weapons"*. Research into such chemicals continued after 2007, but additional papers contained no explicit reference to their potential application as so-called *"pharmacological non-lethal weapons"*. The Czech Republic CWC National Authority has subsequently investigated Czech research activities and in 2014 stated that *"There was no connection [between] the research [and] creation of*

1 Organisation for the Prohibition of Chemical Weapons, *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction* (Chemical Weapons Convention), 1993, http://www.opcw.org/chemical-weapons-convention/ (accessed 1st October 2014).

any sort of weapons or devices which could be used for military or police purposes." With regard to the Czech *"pharmacological non-lethal weapons"* papers, the National Authority stated *"research programmes had justifiable medical goals, but their reporting in public media exceeded actual results of the research thus creating a false impression of possible development of some sort of chemical weapons."*

India: Scientists at the Defence Research & Development Organisation (DRDO) have conducted work related to the synthesis, aersolisation and bio-efficacy of fentanyl and its analogues, as described in papers from 2005 till 2013. In 2014, the Indian CWC National Authority gave *"categorical and unambiguous clarifications"* that India has no stockpile of ICAs, is not involved in the weaponisation of ICAs and that *"research on fentanyl is being carried out in India only for the purpose of protection."* It is not known whether such activities have been reported to the Organisation for the Prohibition of Chemical Weapons (OPCW) as part of India's annual declaration of national programmes related to *"protective purposes"*.

Iran: Research scientists at Imam Hossein University (IHU) have explored the structural-activity relationships of fentanyl and its analogues and have attempted to generate stable long lasting aerosols of medetomidine and other potential ICAs; their work is detailed in papers from 2007 till 2013. IHU is an academic institution run along military lines and controlled by the Iranian Revolutionary Guard. In 2014, the Iranian CWC National Authority stated that the lead researcher was *"interested in advance [of] academic and scientific chemical issues that [are] not prohibited by the Chemical Weapons Convention"* and that the "*academic research is financed by [the] ministry of science and technology* and is *"solely [for] scientific purposes"*.

Israel: Israeli security services have employed an ICA weapon as an attempted assassination tool on at least one occasion, in 1997. There is insufficient publicly available information to determine whether any Israeli entity is currently undertaking research into weapons employing ICAs, or whether Israel holds stockpiles of such weapons. There is limited information available indicating that the Israel Institute for Biological Research may be conducting work in potentially relevant dual-use fields, although the details of the specific research projects are not available.

Russian Federation: The Soviet Union and subsequently the Russian Federation conducted research into ICA weapons prior to and following the coming into force of the CWC. In

2002, Russian Security forces employed an ICA weapon to free 900 hostages held by Chechen fighters. Although the hostages were freed, 125 hostages died due to the effects of the ICA and an unknown number of former hostages suffer long term injury. Russian researchers have continued work of potential application to ICA weapons. This has included computer modelling of so-called "calmative" gas flows in enclosed spaces, as detailed in a 2009 presentation; and research relating to opiate receptors (OR) and their interaction with OR ligands, detailed in papers from 2005 till 2012.

Syria: Since the 1970s, Syria reportedly acquired and/or developed and stockpiled a range of chemical weapons and agent precursors – this stockpile has now been declared and is being destroyed under OPCW supervision. From early 2012, there have been repeated but, to date, unconfirmed allegations that the Syrian Government armed forces employed ICA weapons during the ongoing conflict with armed opposition forces.

United Kingdom (U.K.): In the early-to-mid-2000s, the U.K. Government assessed the feasibility of introducing ICA weapons for certain law enforcement purposes, but subsequently rejected this option. In 2013, the U.K. *"unequivocally"* declared that it *"neither holds or is developing any ICAs for law enforcement"*. U.K. researchers based at the Defence Science and Technology Laboratory [Porton Down] have conducted research into ICAs for *"protective purposes"* and the U.K. has provided some information on these activities to the U.K. Parliament and the OPCW.

United States of America (U.S.): The U.S. developed ICA weapons containing BZ (3-quinuclidinyl benzilate) in the 1960s. There are no confirmed reports of their use in armed conflict, and all stockpiles were destroyed in the late-1980s and 1990s. The U.S. subsequently conducted research into ICA weapons for both military and law enforcement purposes, prior to and after the coming into force of the CWC, although there is no evidence of completed development or production of ICA weapons. In 2013, the U.S. declared *"very clearly and directly"* that it *"is not developing, producing, stockpiling, or using incapacitating chemical agents"*. It is not currently known whether the U.S. undertakes dual-use research related to ICAs for *"protective purposes"*, and if so how and whether this is reported to the OPCW.

Currently there is no publicly available evidence of concerted attempts by armed non-State actors, such as terrorist groups, to conduct research and development of ICA weapons. There have been isolated reports of small-scale use of "*sleeping gas*" by criminals.

Analysis of open source information concerning both historical ICA development programmes and contemporary research potentially applicable to the study or development of ICA weapons, indicates that such activities have been undertaken either by scientists operating within State research establishments principally linked to defence, security or law enforcement bodies, or by scientists working in civilian research institutions who are funded or controlled by such bodies.

Although evidence of potentially relevant dual-use research has been obtained in a number of States, the full nature and purpose of such research in certain countries is often unclear as are the intended applications to which it will be put. A number of factors have contributed to such uncertainty. These include: the inherent dual or rather multiple applicability of research in these areas, the difficulty with establishing the true intent of the individual researchers or the research institutions, and the contested nature of the application of the CWC in these areas.

There are currently no effective OPCW reporting or transparency mechanisms covering ICA weapons research and development for law enforcement purposes. Consequently, it is unlikely that any CWC States Parties conducting such activities currently provide information to the Organisation in this area. In such an information vacuum, there is a danger that mis-perceptions of entirely benign research may arise, or conversely that ICA weapons development programmes intended for law enforcement or military purposes may operate without the knowledge of the international community.

Research into ICAs for protective purposes appears to have taken place in certain States, as permitted under the CWC. Clearly such work requires some level of secrecy with regard to the threats that are of concern and the responsive measures that are being undertaken. Yet, without some assurance that the work is only directed at defensive requirements such as identification of agents for prophylaxis and treatment, and development of protective measures, there is an obvious danger that mis-perceptions about the nature and purpose of such activities could arise.

The potential for false perceptions about current State activities and misunderstandings about State motivations behind dual-use research, are exacerbated by the inability of the OPCW policy making organs to issue clear guidance as to whether ICA weapons can be employed for law enforcement purposes and if so, under what circumstances. This policy lacuna has left individual States Parties to interpret the scope and nature of their obligations in this area.

Because the possession and utilisation of ICA weapons currently appears to be restricted to a relatively small number of States, there is still time for the international community to act. There is now a window of opportunity for the OPCW to take a precautionary and preventative approach: to

effectively monitor developments in relevant dual-use research and to actively address the attempted development, acquisition, stockpiling and potential employment of these agents as weapons. If the OPCW does not act decisively in the near future, there is a danger that an ever growing number of States will seek to harness advances in relevant scientific disciplines for ICA weapons development programmes, or may be perceived – rightly or wrongly – of doing so. This, in turn, may convince further States to conduct their own ICA weapons research and development programmes or potentially explore an even broader range of chemical agents, with the danger of a consequent spiral of actions and reactions that could weaken or eventually erode away the prohibition of chemical weapons.

Given such concerns, CWC States Parties, both individually and collectively, should consider the following activities and processes for regulating research potentially applicable to the development of ICA weapons:

1) Initiate a mechanism within the OPCW for States Parties to collectively discuss the employment of ICA weapons in law enforcement.

(2) Affirm current national practice is to restrict use of toxic chemicals for law enforcement to riot control agents. Where such restriction is not existing policy, States should introduce national moratoria on the development, acquisition, stockpiling, transfer and use of ICA weapons intended for law enforcement purposes. States should also clearly reaffirm the existing prohibition on the use of toxic properties of all chemicals in armed conflict.

(3) Ensure comprehensive interpretation, effective implementation and wide-spread promulgation of the CWC, including its General Purpose Criterion.

(4) Fulfil existing CWC reporting obligations and introduce additional transparency mechanisms.

(5) Utilise existing CWC consultation, investigation and fact-finding mechanisms when activities of potential concern come to their attention, such as reports of the development, acquisition or use of ICA weapons.

In addition, the Director General and the Technical Secretariat, in consultation with the Scientific Advisory Board (SAB) where appropriate, should:

(1) Develop appropriate verification mechanisms relevant to ICAs, that could be required in an investigation of alleged use.

(2) Review application of OPCW assistance and protection measures in cases of use or threatened use of ICA weapons.

(3) Monitor developments in science and technology applicable to development of ICA weapons, and bring activities of concern to the attention of States Parties.

(4) Conduct a review of the existing legal constraints upon the use of ICA weapons in law enforcement.

Finally, it is important that the non-governmental medical and scientific communities continue to be actively engaged on this issue, and specifically should:

(1) Monitor developments in science and technology related to ICAs and associated means of delivery and highlight attempts to harness such developments in weapons programmes.

(2) Engage with the OPCW to develop and promote possible science-informed policy responses.

(3) Conduct education and awareness-raising amongst the medical, chemical, and life science communities on these issues.

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1. INTRODUCTION: INCAPACITATING CHEMICAL AGENT WEAPONS

This report explores contemporary research into a range of pharmaceutical chemicals that could potentially be – rightly or wrongly - construed as being linked to the study or development of incapacitating chemical agents (ICAs) with weapons utility. The report highlights areas where concerns or mis-perceptions might arise, and explores how States can ensure that such research is not utilised in chemical weapons development or misinterpreted as being utilised for such purposes.

Although certain States and pluri-lateral organisations[2] have sought to characterize incapacitating chemical agents (ICAs), there is currently no internationally accepted definition for these chemical agents. Indeed certain leading scientific experts and international organisations believe that such a technical definition is not possible.[3]

Whilst recognising the contested nature of this discourse, a provisional working description of ICAs based upon the 2012 Royal Society definition will be employed in this report. Consequently, ICAs will be considered as: substances whose purported intended purpose is to cause prolonged but non-permanent disability; they include centrally acting agents producing loss of consciousness, sedation, hallucination, incoherence, paralysis, disorientation or other such effects.[4]

For the purposes of this report, an "ICA weapon" will be considered to comprise an ICA and/or associated means of delivery, developed with the purported intention of temporarily incapacitating but not killing a target. Candidate agents for ICA weapons typically possess a very low safety

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2 See for example: NATO *Glossary of Terms and Definitions* (English and French), NATO document AAP-6(2012), 2012, p. 2-I-2.

3 For example a report of an expert meeting organized by Spiez Laboratory concluded that*: "…because there is no clear-cut line between (non-lethal) ICA [incapacitating chemical agents] and more lethal chemical war-fare agents, a scientifically meaningful definition cannot easily be made. One can describe several toxicological effects that could be used to 'incapacitate', but in principle there is no way to draw a line between ICAs and lethal agents"*, [Spiez Laboratory, *Technical Workshop on Incapacitating Chemical Agents*, Spiez, Switzerland, 8–9 September 2011, 2012, p. 10]; Furthermore, Mr Stefan Mogl, Head of the Chemistry Division at Spiez Laboratory, has noted that "*some agents that were discussed as potential "incapacitating chemical agents" seem to be more toxic than certain classic chemical warfare agents.*" [Mogl, S., Speakers summary: *Technical Workshop on Incapacitating Chemical Agents*, Spiez, Switzerland, 8-9 September 2011; "*Good to know*" in: International Committee of the Red Cross (ICRC), *Expert meeting, "Incapacitating chemical agents": Law enforcement, human rights law and policy perspectives* Montreux, Switzerland, 24th to 26th April 2012, January 2013. Given such considerations and the absence of an internationally accepted legal definition, the International Committee of the Red Cross has argued that the term ICA should not be employed; instead the discussion should be framed around the use of "toxic chemicals" for law enforcement, see: International Committee of the Red Cross, *Toxic Chemicals as Weapons for Law Enforcement: A threat to life and international law?, Synthesis paper*, ICRC, September 2012.

4 Royal Society, Brain Waves Module 3: *Neuroscience, conflict and security*, RS Policy document 06/11, February 2012, pp.44-45. See also: Royal Society, The Chemical Weapons Convention and convergent trends in science and technology: RS Seminar held at the OPCW, 18th February 2013, p.2. For an alternative definition, see: Pearson, A., Chevrier, M. and Wheelis, M. (eds), *Incapacitating Biochemical Weapons*, Lexington Books, Lanham, MD.,2007, p. xii.

margin (the difference between desirable and undesirable effects), so the effects of ICA weapons are in fact variable and can include death.[5] ICA weapons are distinct from riot control agents (RCAs), which act on the peripheral nervous system to produce rapid sensory irritation of the eyes, mucus membranes and skin, and whose effects disappear shortly after termination of exposure.

Unlike riot control agents[6], ICAs are not separately defined under the Chemical Weapons Convention (CWC), but are considered to be toxic chemicals and regulated accordingly. The development, acquisition, stockpiling, transfer or utilisation of such toxic chemicals would be permissible only for *"purposes not prohibited"*, and only where the *"types and quantities"* of such toxic chemicals were consistent with such purposes. Consequently, the employment of ICA weapons in armed conflict is absolutely prohibited under the CWC. However, there are differing interpretations as to whether, and in what circumstances, such toxic chemicals could be employed for law enforcement purposes.

This report has sought to explore relevant contemporary research concerning a variety of toxic chemicals, many of which are currently legitimately used for medical, veterinary or other peaceful purposes, but which could potentially be employed as ICA weapons. Whilst this report limits itself to pharmaceutical chemicals, a second report will subsequently be published as part of the Biochemical Security 2030 project, exploring research concerning bioregulators and toxins (including peptides) which could be employed in chemical or biological weaponisation programmes, including development of ICA weapons.

Proponents of ICA weapons have promoted their development and use in certain law enforcement scenarios, for example in armed sieges where hostages have been taken; they have also been raised as a possible tool in a variety of military operations, especially in situations where fighters and civilians are in close proximity with each other.[7]

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5 See for example: OPCW, Conference of the States Parties, *Report of the Scientific Advisory Board on Developments in Science and Technology for the Third Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention*, Third Review Conference RC-3/DG.1, 8th – 19th April 2013 29th October 2012; Royal Society (February 2012) *op.cit.*, p.44. See also: Royal Society (18th February 2013) *op.cit.*, p.2.

6 See: Organisation for the Prohibition of Chemical Weapons (OPCW), *Chemical Weapons Convention*, 1993, Article II.7. which defines riot control agents as *"Any chemical not listed in a Schedule, which can produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure."*

7 See, for example, Fenton, G. Current and prospective military and law enforcement use of chemical agents for incapacitation, in: Pearson, A.,Chevrier, M. and Wheelis, M. (eds) (2007) *op.cit.*, pp. 103–23; Whitbred, G. Offensive use of chemical technologies by U.S. special operations forces in the global war on terrorism, *Maxwell Paper Number 37*, Maxwell Air Force Base, Air University Press, Alabama, July 2006. According to one observer present during the negotiation of the CWC, considerations of the potential use of toxic agents against mixed populations of combatants and non-combatants was restricted to RCAs and the possible

In contrast, a broad range of observers, including scientific and medical professionals, arms control organisations, international legal experts, human rights and humanitarian organisations, as well as a number of States, are critical of the development and utility of ICA weapons, highlighting that the use of such weapons presents potentially grave dangers to health and well-being. The British Medical Association, for example has concluded that:

> *"The agent whereby people could be incapacitated without risk of death in a tactical situation does not exist and is unlikely to in the foreseeable future. In such a situation, it is and will continue to be, almost impossible to deliver the right agent to the right people in the right dose without exposing the wrong people, or delivering the wrong dose."*[8]

Further concerns that have been raised are the risk of *"creeping legitimisation"* of ICA weapons with the erosion of the norm against the weaponisation of toxicity[9]; the dangers of ICA weapons proliferation to both State and non-State actors[10]; their potential use as a lethal *"force multiplier"*; their employment to facilitate torture and other human rights violations;[11] the further misuse and militarisation of the life sciences[12], the potential for States to use law enforcement ICA weapons development as a cover for covert offensive chemical weapons programmes[13] and the danger of creating a *"slippery slope"* that could lead to chemical warfare.[14]

2. HISTORICAL ICA WEAPONS RESEARCH AND DEVELOPMENT PROGRAMMES

From the late 1940s onwards military, security or police entities and related State policy-making bodies of certain countries have explored the potential utility of ICA weapons. States that reportedly conducted research and attempted development of ICA weapons or acquired such weapons at some stage prior to the signing of the CWC in 1993 included: Albania, China, Iraq, Israel, (Apartheid)

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employment of ICA weapons in such circumstances was not collectively discussed by States. Email correspondence to Dr M.Crowley, BNLWRP, from Dr. R. Trapp, 8th August 2014.

8 British Medical Association, *The use of drugs as weapons: The concerns and responsibilities of healthcare professionals*, BMA, 2007, London, p. 1.

9 Perry Robinson, J. Categories of Challenge now facing the Chemical Weapons Convention, *52nd Pugwash CBW Workshop, 10 Years of the OPCW: Taking Stock and Looking Forward*, Noordwijk, The Netherlands, 17th – 18th March 2007.

10 Pearson, A. Incapacitating Biochemical Weapons: Science, Technology, and Policy for the 21st Century *Nonproliferation Review*, volume 13, number 2, 2006, p.172; Wheelis, M. and Dando, M. Neurobiology: A case study of the imminent militarization of biology, *International Review of the Red Cross*, volume 87, number 859, September 2005, p. 564.

11 Crowley, M. *Dangerous Ambiguities: regulation of riot control agents and incapacitants under the Chemical Weapons Convention*, Bradford University, 2009, pp.61–2.

12 British Medical Association (2007) *op.cit.*, p.1; Wheelis, M. and Dando, M. (September 2005) *op.cit.*

13 Perry Robinson, J. (2007) *op.cit.*, p.19.

14 ICRC (September 2012) *op.cit.*, p.5.

South Africa, the Soviet Union, the United Kingdom, the United States of America and Yugoslavia.[15]

Details of the historical ICA weapons research and development programmes that have been made public are partial and of varying reliability. However, information released by the U.K. and U.S. governments into their past programmes show that the range of pharmaceutical chemicals that were under consideration, as potential ICAs with weapons utility, was extensive. For example, the 1997 United States Army textbook, *Medical Aspects of Chemical and Biological Warfare*, stated that:

> *"Virtually every imaginable chemical technique for producing military incapacitation has been tried at some time. Between 1953 and 1973, at the predecessor laboratories to what is now the U.S. Army Medical Research Institute of Chemical Defense, many of these were discussed and, when deemed feasible, systematically tested. Chemicals whose predominant effects were in the central nervous system were of primary interest and received the most intensive study..."*[16]

The authors went on to suggest that almost all such agents could be put into one of four classes: stimulants, depressants, psychedelics and deliriants. Stimulants include, for example, amphetamines and cocaine, depressants include barbiturates, and psychedelics include LSD. Delirium, *"an incapacitating syndrome, involving confusion, hallucinosis, disorganized speech and behavior,"* can be produced by a wide variety of drugs. But as the text pointed out*: "...From this large number of possibilities, chemical compounds in a single subgroup - the 'anticholinergics' – are regarded as most likely to be used as military incapacitating agents."*[17]

The U.S. studies that were carried out on such deleriant agents have been described in some detail,[18]and one, BZ (3-quinuclidinyl benzilate),[19] was weaponised by the United States. BZ interferes with the operation of the acetylcholine neurotransmitter in the brain by binding to muscarinic receptors for the transmitter. However, as there are many types of such receptors, the

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15 Further information concerning historical ICA weapons research and development activities conducted by a number of these States is included in the country case studies in Section 4 of this report. See also: Perry Robinson, J., Incapacitating chemical agents in context: an historical overview of States' policy, pp.89-96 in: ICRC 2012 expert meeting report (January 2013) *op.cit.;* Royal Society (2012) *op.cit.*, pp.10-13; Crowley, M. (2009) *op.cit.*; Dando, M. and Furmanski, M. Midspectrum Incapacitant Programs, in: Wheelis, M., Rózsa, L. and Dando, M. (eds), *Deadly Cultures: Biological Weapons Since 1945*, 2006.

16 Ketchum, J. S. and Sidell, F. R. Incapacitating agents. pp. 287-305 in: F. R. Sidell, E. T. Takafuji and D. R. Franz (eds), *Military Aspects of Chemical and Biological Warfare*. Office of the Surgeon General, U.S. Army, Washingon D.C., 1997, p. 291.

17 Ketchum, J. S. and Sidell, F. R. (1997) *op.cit.*, p.294.

18 Ketchum, J. S. *Chemical Warfare: Secrets Almost Forgotten*. Private publication, United States. ISBN: 1-4243-0080-0., 2006.

19 Given the attempts to weaponise this chemical agent, BZ is listed under Schedule 2.a. of the Chemical Weapons Convention. Two of its immediate precursors, 3-Quinuclidinol and Benzilic Acid are also listed (both under Schedule 2.b.), See: OPCW, *Chemical Weapons Convention* (1993) *op.cit.*, Annex on Chemicals, B. Schedules of Chemicals, Schedule 2.

effects of BZ are complex and the behaviour produced was unpredictable.[20] Consequently, it is not surprising that there have been no confirmed reports of its use by the United States in armed conflict, and that all U.S. BZ weapons stockpiles were subsequently destroyed.

3. ADVANCES IN SCIENCE AND TECHNOLOGY AND THEIR POTENTIAL APPLICATION IN ICA WEAPONS RESEARCH AND DEVELOPMENT

In the light of previous attempts by a number of States to develop ICA weapons, a range of national and international scientific and medical bodies have assessed the revolutionary changes that have taken place in relevant life and chemical scientific disciplines and technologies over the last 20 years and have explored the potential likelihood for, and the implications of, the misuse of such research.[21] Of particular potential relevance have been developments in neuroscience, medicinal chemistry, pharmacology[22], and their convergence in specialisms such as neuropharmacology, psychopharmacology and neuropsychopharmacology.[23]

In its 2008 and 2012 Reports for CWC States Parties to consider in preparation for the 2nd and 3rd CWC Review Conferences, the OPCW Scientific Advisory Board (SAB)[24] discussed the rapidly changing nature of drug design and the development of technology that allowed the fast synthesis and screening of many thousands of chemicals to find chemicals with desired properties. Tools for parallel multi-compound synthesis have become widely available, and together with simultaneous high-throughput screening for biological activity against *in vitro*-test systems, have produced data on millions of possibly new biologically active chemicals.

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20 Dando, M. R. *A New Form of Warfare: The Rise of Non-Lethal Weapons*. Brassey's, London, 1996, pp. 90-94.

21 For discussion see for example: Spiez Laboratory (2012) *op.cit.*, pp. 15-16 &26-30; Royal Society (2012) *op.cit.*, pp.43-52; Balali-Mood, M., Steyn, P., Sydnes, L., Trapp, R. International Union of Pure and Applied Chemistry (IUPAC), *Impact of Scientific Developments on the Chemical Weapons Convention (IUPAC Technical Report)*, January 2008; British Medical Association (May 2007) *op.cit.*; Smallwood, K. Trapp, R. Mathews, R. Schmidt, B. and Sydnes, L. Impact of scientific developments on the Chemical Weapons Convention (IUPAC Technical Report), *Pure and Applied Chemistry*, volume 85, number 4, 2013, pp.851-881.

22 Medicinal chemistry can be considered as the identification, development, production and evaluation of chemicals for potential use as pharmaceutical drugs. Pharmacology is the study of the action of drugs on living systems. Neuroscience is the study of how genetics and the environment affect neurotransmitter-receptor systems in the brain and nervous system, and how these systems in turn affect behaviour.

23 Neuropharmacology is the study of drug-induced changes in the functioning of cells in the nervous system. Psychopharmacology is the study of drug-induced changes in mood, thinking and behavior. Neuropsychopharmacology is the convergence of medicinal chemistry, pharmacology and neuroscience to study the physiological and psychological properties of chemicals acting within the central nervous system.

24 OPCW, Conference of the States Parties, *Report of the Scientific Advisory Board on Developments in Science and Technology for the Third Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention*, Third Review Conference RC-3/DG.1, 8th – 19th April 2013 29th October 2012; OPCW, Conference of the States Parties, *Note by the Director-General, Report of the Scientific Advisory Board on Developments in Science and Technology*, Second Review Conference RC-2/DG.1, 7th – 18th April 2008, 28th February 2008.

Similarly, revolutionary advances in the life sciences have led to a better understanding of the functioning of the brain, nervous system and other regulatory systems in the human body[25], and on how certain chemicals could interact with them. All this knowledge is likely to provide significant benefits to society[26], however given its multi-faceted applicability, these advances could also potentially be exploited for military and law enforcement applications, including the development of ICAs with weapons utility.[27]

3.1. SELECTED POTENTIAL CANDIDATE ICAS WITH WEAPONS UTILITY

There are indications from open source information that research related to ICA weapons development continued after the coming into force of the CWC and may still be taking place in certain States, although the range of agent types under active consideration may have narrowed. As the Royal Society *Brain Waves* study report stated: *"Many different forms of incapacitation were investigated during the Cold War, but with increasing emphasis on rapid action and short duration of effects, contemporary interest has tended to focus on sedative-hypnotic agents that reduce alertness and, as the dose increases, produce sedation, sleep, anaesthesia and death."*[28]

Consequently, studies such as that of the Royal Society have concentrated upon contemporary dual-use research related to a narrower range of pharmaceutical chemicals, highlighting actual or potential application in ICA weapons development. Some of the key chemical types considered, are outlined in Table 1.

25 See, for example: Royal Society (2012) *op.cit.*; Royal Society, Brain Waves, Module 1: Neuroscience, Society and Policy, January 2011; Andreasen, N. *Brave New Brain: Conquering Mental Illness in the Era of the Genome*, Oxford University Press U.S., 2004; *Neuroscience 2000: A New Era of Discovery*, Symposium Organised by the Society of Neuroscience, Washington DC, 12th -13th April 1999.

26 Royal Society (2012) *op.cit.*, p.50.

27 Spiez Laboratory, *Incapacitating chemical agents, Fact sheet*, February 2013. http://www.labor-spiez.ch/en/akt/pdf/SCHB_Fact_Sheet_ICA_final_20130308.pdf (accessed 1st July 2014).

28 Royal Society (2012) *op.cit.*, p. 46.

Table 1: Summary of selected potential candidate ICAs with weapons utility

Opioids	Morphine is the prototypical opioid analgesic used in the treatment of moderate to severe pain, however its use is associated with respiratory depression, sedation and addiction. The search for novel opioid narcotic agents that do not cause such side effects is still being actively pursued.[29] Fentanyl, for example, is a synthetic opioid many times more powerful in its effects than morphine, and a large number of fentanyl derivatives have been investigated, although the potential for respiratory depression remains problematic. However, despite advances in analogue synthesis[30] , greater understanding of analogue interactions with the μ receptor in humans and consequent effects upon their targets; the operational use of such fentanyl analogues as ICA weapons, as shown in the 2002 Moscow theatre siege, has still resulted in many deaths.
Benzodiazepines	GABA (γ-aminobutyric acid) is a major inhibitory neurotransmitter in the central nervous system. Benzodiazepines enhance the effect of GABA on $GABA_A$ receptors and have therefore found use in the treatment of anxiety and induction of anaesthesia, but they also affect respiration and the blood system. Again, much research has been carried out in an effort to, for example, find faster- and shorter-acting agents with more precise effects, and some of this research may have applicability for ICA weapons development.[31]
Alpha 2 adrenoceptor agonists	The *locus coeruleus* neurons in the brain produce the neurotransmitter noradrenaline and have widespread ramifications that function to help induce the alert wakeful state. Alpha 2 adrenoceptors provide inhibitory negative feedback to the *locus coeruleus* neurons when they produce noradrenaline. [32] An agent such as dexmedetomidine, therefore, that mimics the effect of the natural transmitter (i.e. an analogue) can also reduce alertness and wakefulness. It can therefore find medical use in anaesthesia and has also been investigated as a potential ICA weapon.[33]
Neuroleptic anaesthetic agents	Neuroleptic anaesthesia, unlike conventional general anaesthesia, produces a state of unawareness in the patient characterised by unconsciousness and analgesia whilst patient muscle tone and reflexes remain largely intact. [34] Consequently, researchers have highlighted the potential application of combinations of neuroleptic anaesthetic agents as ICA weapons, particularly given the possibility of developing a mixture of agents that would produce the neuroleptic state without causing undesired side effects.[35]

29 Royal Society (2012) *op.cit.,* p. 47.
30 Dosen-Micovic, L. Molecular modelling of fentanyl analogs. *Journal of the Serbian Chemical. Society*, volume 69, 2004, pp.843-854.
31 Royal Society (2012) *op.cit.,* pp.47-48.
32 Royal Society (2012) *op.cit.,* p.48.
33 Lakoski, J., Murray, W., and Kenny, J. *The advantages and limitations of calmatives for use as a non-lethal technique*, College of Medicine Applied Research Laboratory, Pennsylvania State University, 3rd October 2000, p. 37.
34 Royal Society (2012) *op.cit.,* pp. 48-49.
35 See for example: Lakoski, J., Murray, W., and Kenny, J. (October 2000) *op.cit.*, p. 37.

3.2. MEANS OF DELIVERY

In addition to discovery or synthetic development of candidate ICAs and analysis of the physiological pathways on which they will act, those seeking to employ such agents as weapons must also overcome the challenge of ensuring a controlled delivery of ICAs to the target population. Two factors influence such agent delivery: dissemination - the transport of the agent from the attacker to the immediate vicinity of the targeted person or persons; and, uptake - the subsequent movement of the agent to its active site within the target.[36]

With regard to agent dissemination, the 2012 Royal Society study highlighted the rapid advances in aerosol technology that have already been employed to deliver effective inhaled drug therapy for the treatment of disease[37] and warned that *"Advances in research into inhalation based methods of drug and vaccine delivery may offer potential applications in the delivery of agents for incapacitation."*[38]

Of potentially greater concern were the findings of the National Research Council (NRC) in its 2008 report on *Emerging Cognitive Neuroscience and Related Technologies*[39] which described developments in nanotechnologies and gas-phase techniques that could provide improved means of dispersal of chemicals agents over wide areas.[40] It noted that at the time *"pharmacological agents [were] not used as weapons of mass effect, because their large-scale deployment [was] impractical"* as it was *"currently impossible to get an effective dose to a combatant."*[41] However the report stated that *"technologies that could be available in the next 20 years would allow dispersal of agents in delivery vehicles that would be analogous to a pharmacological cluster bomb or a land mine."*[42]

Such concerns are exacerbated by the current development, production and commercial availability of an extensive range of delivery mechanisms marketed for the dispersal of RCAs some of which could be utilised or adapted for delivering other toxic chemicals, potentially including weaponised ICAs. Of particular relevance are delivery systems that can be utilised for dispersing significant

36 Royal Society (2012) *op.cit.*, p.50.
37 Royal Society (2012) *op.cit.*, p.50.
38 Royal Society (2012) *op.cit.*, p.51.
39 National Research Council, *Emerging Cognitive Neuroscience and Related Technologies*, 2008, http://www.nap.edu/openbook.php?record_id=12177 (accessed 11th August 2014).
40 See also National Academies of Science, *Trends in Science and Technology Relevant to the Biological and Toxin Weapons Convention: Summary of an International Workshop*. October 31 to November 3, 2010, Beijing, China, The National Academies Press: Washington, DC, 2011. See in particular: Remarks: Implications Stemming From Advances in Dual-Use Targeted Delivery Systems, Nixdorff, K., pp.18-19.
41 National Research Council (2008) *op.cit.*, p.137.
42 National Research Council (2008) *op.cit.*, p.137.

amounts of RCA over wide areas and/or over extended distances, including "smoke" agent generators, large tank sprayers, cluster munitions, mortar shells, large calibre projectiles, heliborne dispensers and unmanned aerial vehicles.[43] "Wide area" RCA munitions have recently begun to receive some attention in the OPCW, with the SAB raising the issue in its 2012 report to States Parties on developments in science in technology, in preparation for the Third CWC Review Conference. The SAB *"note[d] with concern isolated reports of the commercial availability of munitions apparently designed to deliver large amounts of riot control agents over long distances."*[44]

In addition, a range of equipment for the aerosolised dispersal of chemicals over large areas, and marketed for commercial purposes such as crop spraying, is widely available from a variety of uncontrolled sources.[45] In its 2012 report, the SAB highlighted the potential misuse of equipment such as *"spray and fogging devices developed by the pesticide industry or developed for veterinary treatment of large-scale animal farms"* by non-State actors for the dissemination of chemical weapons and biological weapons agents. [46]

With regard to agent uptake, the implications of developments in particle engineering and nanotechnology that could allow the delivery of biologically active chemicals to specific target organs or receptors have been highlighted by a number of scientific bodies[47] including the NRC in is 2008 report which specifically warned that nanotechnologies could be used to overcome the blood-brain barrier and thereby *"enable unparalleled access to the brain. Nanotechnologies can also exploit existing transport mechanisms to transmit substances into the brain in analogy with the Trojan horse"*[48]

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43 Crowley, M. *Drawing the line: Regulation of "wide area" riot control agent delivery mechanisms under the Chemical Weapons Convention*, Bradford Non-Lethal Weapons Project & Omega Research Foundation, April 2013; Crowley, M. and Perkins, D., *Beyond the Horizon: "Wide Area" Riot Control Agents Means of Delivery and Their Relevance to the CWC, BWC and UNSCR 1540*, Biochemical Security 2030 Policy Paper Series, Paper 4, February 2014,

44 OPCW, Conference of the States Parties, *Report of the Scientific Advisory Board on Developments in Science and Technology for the Third Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention*, RC-3/DG.1, Third Review Conference, 8th – 19th April 2013, 29th October 2012, paragraph 56.

45 See: Zilinskas, R. and Alramini, H. Aerosol vaccines, in: *Innovation, Dual Use, and Security: Managing the risks of emerging biological and chemical technologies* (ed:Tucker, J.), MIT Press, Cambridge, Massachusetts, U.S., pp.261-271.

46 OPCW, Conference of the States Parties, *SAB Report*, RC-3/DG.1, Third Review Conference, (29th October 2012) *op.cit.*, paragraph 56.

47 See also: Balali-Mood, M., Steyn, P., Sydnes, L., Trapp, R/ IUPAC (January 2008) *op.cit.*, paragraphs 11 and 12; OPCW, Conference of the States Parties, *SAB Report*, Second Review Conference RC-2/DG.1, (28th February 2008) *op.cit.*, paragraphs 2.5 – 2.8; OPCW, Conference of the States Parties, SAB Report, RC-3/DG.1, Third Review Conference,(29th October 2012) op.cit., paragraphs 50-53, 55, 57 and 58.

48 National Research Council (2008) *op.cit.*, p.135.

In its 2012 report, the SAB noted that: *"Features that promote the effective and targeted delivery of drugs via the respiratory system would be applicable to the dissemination of a toxic chemical, especially a solid disseminated as a particulate aerosol."* [49] One development that the SAB specifically highlighted in this regard was the *"use of porous nanoparticles as carriers composed, for example, of silica or L-lactide that allow delivery of drugs into the deep alveolar regions of the lungs."* [50] The SAB stated that *"although the optimisation of a well-engineered particle requires expertise and considerable effort...the equipment needed to create such particles is relatively inexpensive...*[and]*...* ***the technology could be exploited in the design of incapacitants."***[51] [Emphasis added].

3.3. DUAL-USE CONSIDERATIONS AND MONITORING TECHNOLOGIES AND PROCESSES OF CONCERN

Dual-use is a concept that can be applied to the tangible and intangible features of a technology that enable it to be utilised for both hostile and peaceful ends with no, or only minor, modifications.[52] Authors who have examined historical attempts by a State to utilise dual-use technology in a biological weapons programme have highlighted the importance of intent in determining whether a particular dual-use technology or agent is so employed. The hostile use of a specific agent or technology does not arise automatically from the inherent properties of that agent or technology, but requires the active intervention of relevant actors.[53]

These concepts can be employed in a variety of contexts and for a variety of technologies. They are of course central to the understanding of the concerns explored in this report. Indeed previous attempts in certain States to identify ICAs with weapons utility have explicitly highlighted and sought to employ the potential dual-use applications of drugs initially developed for medical purposes. For example, the 2000 report of the study conducted by the Applied Research Laboratory and the College of Medicine at Pennsylvania State University to identify the range of drug classes that had potential utility as ICA weapons, stated that:

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49 OPCW, Conference of the States Parties, *SAB Report*, RC-3/DG.1, Third Review Conference, (29th October 2012) *op.cit.*, paragraph 58.

50 OPCW, Conference of the States Parties, *SAB Report*, RC-3/DG.1, Third Review Conference, (29th October 2012) *op.cit.*, paragraph 58.

51 OPCW, Conference of the States Parties, *SAB Report*, RC-3/DG.1, Third Review Conference, (29th October 2012) *op.cit.*, paragraph 58.

52 Molas-Gallart, J. and Perry Robinson, J. *Assessment of Dual-use Technologies in the Context of European Security and Defence*, Report for the Scientific and Technological Options Assessment (STOA), European Parliament, 1997.

53 McLeish, C. and Balmer, B. Development of the V-Series Nerve Agents in: *Innovation, Dual Use, and Security: Managing the risks of emerging biological and chemical technologies* (ed: Tucker, J.), MIT Press, Cambridge, Massachusetts, U.S., pp. 273-289; See also: McLeish, C. Reflecting on the dual-use problem, in: *A Web of Prevention: Biological Weapons, Life Sciences, and the Governance of Research* (eds. Rappert, B. and McLeish, C.)., 2007, Routledge, U.K.

> *''It is well known that for every one new compound successfully proceeding from the discovery phase through all phases of clinical trials and on to market, perhaps hundreds, if not thousands, of compounds are discarded or shelved by the pharmaceutical industry [for example, as a result of their side effects] … However, in the variety of situations in which non-lethal techniques are used there may be less need to be concerned with side-effects; indeed, perhaps a calmative may be designed that incorporates a less than desirable side-effect … as part of the drug profile''.*[54]

Furthermore, the Penn State study recommended explicit collaboration in this area, stating that *'it may be appropriate to develop a working relationship with the pharmaceutical industry to better incorporate their knowledge and expertise in developing a non-lethal calmative technique'*.[55]

The search for candidate ICAs with potential weapons utility is likely to be informed by current advances in neuropharmacology, genomics and related disciplines which have revolutionized understanding of the brain neurotransmitter/neuroreceptor systems. Although such research is at a very early stage in the understanding of the ways in which chemicals are used in the brain's information-processing system and while it may seem that finding an effective, safe ICA weapon is not possible, the search may continue to prove attractive to certain States as apparently new opportunities arise.[56]

In such circumstances, in addition to work on efficient new methods of production of known agents other dual-use research could also raise concern. For example, attempts to design and synthesise novel (more effective) analogues of known agents; to study the structure of known receptor sub-types; or to explore the effects of multiple agents designed to counter unwanted side-effects, might be misperceived if there was not adequate transparency to ensure that peaceful intentions were well understood. Similarly, studies exploring potential ICA or surrogate agent aerosolisation, dispersal

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54 Lakoski, J., Murray, W., and Kenny, J. (2000) *op. cit.*, p. 48.

55 Lakoski, J., Murray, W., and Kenny, J. (2000) *op. cit.*, p. 48. Perry Robinson has detailed the previous attempts in the U.S. by the Industrial Liaison Office of the Army Chemical Corp and the Edgewood Arsenal to work with the U.S. pharmaceutical industry during the 1950s and 1960s to explore potential new agents for ICA weapons development. [See: Perry Robinson, J. *Disabling Chemical Weapons A Documented Chronology of Events, 1945-2011*, 20th November 2012 (copy provided by author), entry 611100]. In the U.K., the Army, in its annual report detailing the 1964/65 research programme described the work on ICA weapons by the Chemical Defence Experimental Establishment at Porton Down: *"Several other leads are being followed but the main one has been the derivative of thebaine which causes physical incapacity in man bordering on catalepsy. These materials are effective at very low dosage and would clearly give effects which last and which would be of military significance… The work continues in conjunction with a close liaison with industry on the subject and in close collaboration with the US."* [See: Army Department, note to the Defence Research Committee, Ministry of Defence, *The Army Department Research Programme 1964/65*, DR/P(64)35 dated 23 Dec 64, p 14, marked SECRET - UK EYES ONLY, in PRO file DEFE 10/571, as cited in: Perry Robinson, J. (20th November 2012) *op.cit.* entry 641223].

56 For further discussion see, for example: Corriveau, J. and Feasel, M. Incapacitating agents, pp. 245-256, in: *Inhalation Toxicology*, Third Edition (Eds Salem, H. and Katz, S.), CRC Press, 2014. Corriveau and Feasel highlighted research relating to iodobenzoylnaltrexamide (IBNtxA) a potent analgesic that lacked adverse side effects, such as respiratory depression. The authors also discussed the use of ampakines in combination with fentanyl and other opioids, as ampakines appear to reverse respiratory depression without loss of analgesia. See also Dando, M. R. Scientific outlook for the development of incapacitants, pp. 123-148, in: Pearson, A., Chevrier, M. and Wheelis, M. (eds) (2007) *op.cit.*

and uptake for which there appears to be little justification for medical, veterinary or other peaceful purposes, need to be closely monitored.

In addition to monitoring such processes, it is important to look beyond research directly connected to particular potential chemical agents or means of delivery, and also explore the mechanisms by which such research may be transformed from that undertaken to further knowledge, or for the development of pharmaceutical drugs to alleviate illness and disability; to be instead employed in the development of ICA weapons. Such considerations have informed the indicators of potential concern utilized in the open source survey conducted by the authors, as discussed below.

4. SURVEY OF CONTEMPORARY RESEARCH POTENTIALLY APPLICABLE TO THE STUDY OR DEVELOPMENT OF ICAS AND ASSOCIATED MEANS OF DELIVERY

4.1. METHODOLOGY

A survey of open source information relating to contemporary chemical and life science research of potential relevance to the study or development of ICAs and associated means of delivery was conducted in two stages, by the authors. In stage one, an initial survey of relevant open source literature was undertaken including scientific and medical databases and publications detailing research activities in relevant disciplines; Government documents pertaining to past State ICA weapons development programmes; technology monitoring or evaluation reports from bodies such as the Scientific Advisory Board of the OPCW, the American Association for the Advancement of Science, the U.K. Royal Society, IUPAC, Spiez Laboratory and Penn State University. The information obtained was reviewed against a range of indicators of potential concern (as detailed in Table 2), so as to narrow the focus of subsequent in-depth research conducted in stage two to a discrete number of illustrative country case studies (detailed in section 4.2).

Table 2: Factors that may indicate research activities of potential concern

Information pertaining to policy and practice associated with ICA weapons	(a) Reported use of ICA weapons by a State (or non-State) actor either inside its own territory or in the territory of another State that occurred following the coming into force of the CWC; (b) Reported research, development, production, acquisition, stockpiling, deployment or use of an ICA weapon by a State (or non-State) actor either inside its own territory or in the territory of another State that occurred prior to the coming into force of the CWC, particularly where a State has not subsequently introduced a moratorium upon such activities; (c) Reported development, production, acquisition, stockpiling and/or deployment of an ICA weapon by State actors including military, security or police forces, or non-State actors, following the coming into force of the CWC; (d) Reported research activities conducted as part of programmes that may or may not have succeeded in developing an ICA weapon; (e) Statements or publications by entities advocating use of ICA weapons, intention to develop ICAs and associated means of delivery or solicitations for researchers to tender for such activities.
Information pertaining to research establishments and researchers	Dual-use work (research and development) undertaken: (a) Under the auspices of research establishments controlled, directly or indirectly by defence, security or law enforcement organisations, or who receive significant funding from such organisations; (b) Under the auspices of research establishments that have previously been engaged in ICA weapons development programmes or the weaponisation of other chemical agents; (c) By scientists who have stated that they are conducting or have conducted research related to ICA weapons; (d) By scientists with current or previous links to defence, security or law enforcement organisations and related research establishments; (e) By scientists conducting research that could readily be employed in development of ICAs and/or associated means of delivery, and which has little or no direct and immediate relevance to medical, veterinary or other peaceful purposes.
Information pertaining to specific research activities potentially applicable to	Dual-use work (research and development) undertaken involving: (a) Aerolisation of pharmaceutical chemicals that could be employed as ICA weapons (particularly with humans or primates as subjects);

the study or development of ICA weapons	(b) Mechnisms of incapacitation such as: - Modification of pharmaceutical chemicals or development and synthesis of novel analogues to generate agents potentially more suitable for employment as ICA weapons; - Studies of the structure and function of receptors for pharmaceutical chemicals that could be employed as ICA weapons; - Studies of the structure and function of physiological systems involved in incapacitation of humans, primates or other surrogate subjects;
Information pertaining to the national scientific and medical research community	Dual-use work (research and development) undertaken where: (a) There is inadequate parliamentary or other independent oversight; (b) There are inadequate reporting and public transparency measures; (c) The chemical, life science and medical communities have not introduced appropriate measures such as codes of conduct, and education and outreach activities informing scientists of their ethical responsibilities to combat the misuse of dual-use research for chemical weapons development.

Information concerning research potentially related to ICA weapons development has proven difficult to uncover and substantiate; public access to such information is presumed to be severely restricted on stated national security grounds. Consequently, this review is by no means exhaustive, and the spread of States and research entities cited in the country case studies does not purport to be a complete picture of contemporary research activities in this area. Instead it reflects the open source information (predominately in English) that could be obtained by the authors at the time.

Prior to publication, repeated attempts were made to contact the National Authorities and Permanent Representatives of the CWC States Parties detailed in the report to provide them with an opportunity for clarification; substantive responses are cited in the study report, as appropriate.

4.2. COUNTRY CASE STUDIES

4.2.1. CHINA

From at-least the mid-1990s there appears to have been development, production and promotion of a weapon incorporating an incapacitating chemical agent for use in law enforcement operations against individuals. In 1995, marketing materials distributed internationally by the State-owned China North Industries Corporation (NORINCO) promoted the *"BBQ-901 anaesthetic gun system"*.

This weapon discharges a projectile, with an effective range of 40 metres, which on impact injects a liquid incapacitating chemical agent into the target. [57]

Figure 1: Image of *"model BBQ-901 anaesthetic system"* taken from Security, Anti-Riot Weapons and Ammunition brochure, China North Industries Corporation (NORINCO), distributed during MILIPOL security exhibition, Paris, France, 21st – 24th November 1995.

In 1996, an entry on the BBQ-901 in *Janes Police and Security Equipment* reported that:

> *"Depending upon the particular anaesthetic specified, the victim will be rendered unconscious within 1 to 3 minutes, this time obviously varying with individuals and with the placement of the projectile. The effects wear off after 3 or 4 more minutes, giving sufficient time to place the victim in restraint."*[58]

According to NORINCO:

> *"The Model BBQ-901 Anaesthetic system is a fine unlethal [sic] special weapon system for SWAT units and other special usage…It can be used for reconnaissance and capture of criminals in a concealed place. It is also used as a riot control weapon to subdue the ruffians and maintain public order."*[59]

57 *Security, Anti-Riot Weapons and Ammunition* brochure, China North Industries Corporation (NORINCO), undated, brochure distributed at MILIPOL security exhibition, Paris, 1995 (copy on file with the Omega Research Foundation), p.11.

58 *Janes Police and Security Equipment 1995-1996*, (ed.) Hogg, I., Janes Information Group Limited, Coulsden, Surrey, 1996, p.306. An essentially identical listing appeared in subsequent editions, with the last being: *Janes Police and Security Equipment 2005-2006*, (ed.) McBride, M. Janes Information Group Limited, Coulsden, Surrey, 2006, p.518.

59 NORINCO brochure (undated) *op.cit.* [distributed at MILIPOL 1995], p.11.

Figure 2: Image of "*BBQ-901 narcosis gun*" taken from State 9616 Plant company brochure, distributed at Asia Pacific China Police Expo 2004, Beijing, China, 23rd - 26th June 2004.

Figure 3: Poster for "*BBQ-901 narcosis gun*" on display on State 9616 Plant stand at Asia Pacific China Police Expo 2006, Beijing, China, 24th -27th May 2006. © Robin Ballantyne/Omega Research Foundation

In 2004, the essentially similar if not identical, *"BBQ-901 narcosis gun"* was promoted by a second Chinese State-owned company, State 9616 Plant, at the Asia Pacific China Police Expo held in Beijing.[60] The narcosis gun was subsequently promoted by State 9616 Plant at the 2006 Asia Pacific China Police Expo.[61] According to the company's brochure, the BBQ-901 is a *"self-researched weapon"* and State 9616 Plant were subsequently awarded the *"State Second-class Science and Technology Advancement Diploma"* for its manufacture.[62] The BBQ-901 *"is used to scout and capture snugly for patrol. It is an advanced weapon for obtaining important intelligence or completing other special mission."* [63] The marketing materials stated that the weapon's *"characteristic is excellent silence, high precision, quick narcotism, eximious reliability, quick revival, small cubage, light weight, easy schlepping and handsome model etc. It is a pioneer in the middle of police and military narcosis-gun."* [64] Under a description of the weapon's *"main tactics and technical parameters"* the brochure stated that after an individual had *"been hit, the target cannot move and counteract for less than 1 minute. After 3 minute[s] the first aid function to the target is the best than any other time."* [65]

60 State 9619 Plant company brochure, undated, distributed at Asia Pacific China Police Expo 2004, 23rd -26th June 2004, Beijing Exhibition Centre, Beijing, China, (copy on file with the Omega Research Foundation).

61 An apparently identical State 9616 Plant company brochure was distributed by company representatives at Asia Pacific China Police Expo 2006 [24th-27th May 2006, Beijing Exhibition Centre, Beijing, China] (copy of brochure on file with the Omega Research Foundation). For further information about State 9619 Plant products including the BBQ-901 see full exhibitors list: http://www.cpexhibition.com/police/police_main.html#2006expo (accessed 25th March 2014).

62 State 9616 Plant company brochure (undated) *op.cit,* [distributed at China Police 2004/2006], p.9.

63 State 9616 Plant company brochure (undated) *op.cit,* [distributed at China Police 2004/2006], p.9.

64 State 9616 Plant company brochure (undated) *op.cit,* [distributed at China Police 2004/2006], p.9.

65 State 9616 Plant company brochure (undated) *op.cit,* [distributed at China Police 2004/2006], p.9.

Figure 4: "*BBQ-901 tranquiliser gun*" being displayed at a People's Liberation Army "*open day*", Shek Kong Air Base, Hong Kong, 2nd May 2011. © Gordon Arthur / King Arthur's Writes.

In March 2012, *Defence Asia Review* reported that a *"recent public display"* by the Hong Kong garrison of the People's Liberation Army (PLA) included *"a BBQ-901 tranquiliser gun (a pistol-type air gun fitted with a folding stock)"*.[66] The author of this article, Gordon Arthur, had in 2011 photographed a previous display of the BBQ-901 by the PLA in Hong Kong.[67] As of 10th October 2014, there is no further information publicly available regarding the stockpiling or employment of this weapon within China, nor of international transfers.

In July 2005, *Military Review*, a U.S. Army Journal, contained a speculative article by two Chinese analysts - Guo Ji-wei, Director of the Department of Medical Affairs, Southwest Hospital,

66 Arthur, G. New Equipment in Hong Kong, *Defence Review Asia*, 19th March 2012, http://www.defencereviewasia.com/articles/153/NEW-EQUIPMENT-IN-HONG-KONG (accessed 11th August 2014), p.35.

67 Email correspondence to Dr M. Crowley, BNWLRP, from Mr G. Arthur, 16th August 2014.

Chongqing, and Yang Xue-sen, a biotechnology lecturer and writer - in which they stated: *"In the field of military affairs, modern biotechnology maintains a rapid pace of development and plays an important role in medical protection. However, it is gradually revealing a character of aggression as well. Therefore, it is of increasing military value."*[68]

The authors further claimed that *"...war through the command of biotechnology..."* will *"...ultimately, lead to success through ultramicro, nonlethal and reversible effects."*[69]

In 2011, a paper by Qi, Cheng, Zuo, Li and Fan, all from the Institute of Chemical Defence, examined the degradation pathways of fentanyl and its analogues.[70] The authors noted that:

> *"[T]hese kinds of compounds can also be utilised as incapacitants in countering terrorism. In October 2002, the analogues of fentanyl were reported to be successfully used in the Accident* [sic] *of rescuing hostages in Russia. In recent years, the analgesic and anesthetic medicines have gained attention in the world over. The dealing methods of these compounds are of great importance to criminalistics and countering terrorism."*[71]

China has clearly developed weapons employing ICAs for law enforcement purposes which are in the possession of the PLA. Such weapons appear to be restricted to those targeting individuals. To date, China has made no statement clarifying whether any Chinese research entity has conducted or is conducting research activities related to the development of ICA weapons targeting groups of individuals, and if so, for what purposes.

The use of any toxic chemical as a weapon in armed conflict is absolutely prohibited under international law including the CWC and customary international humanitarian law (IHL). China would presumably align itself to the *"Proposal by the NAM CWC States Parties and China on the Draft Report of the Second Review Conference"*, distributed in April 2008, which recommended that the Conference should *"categorically condemn[ed] the use of chemical weapons including incapacitating agents or riot control agents as a method of warfare by any state, group or individual under any circumstances."*[72] China has not formally clarified whether it considers the use of ICA weapons for law enforcement purposes to be permissible under the CWC and relevant international law, and if so under what circumstances. It would be beneficial if China made a formal

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68 Guo Ji-Wei and Xue-sen Yang, Ultramicro, Nonlethal and Reversible: Looking Ahead to Military Biotechnology, *Military Review*, July-August 2005, p.75 [available at: http://www.army.mil/professionalWriting/volumes/volume3/october_2005/10_05_4.html (accessed 25th March 2014].

69 Guo Ji-Wei and Xue-sen Yang (2005), *op.cit.*, p.75.

70 Qi, L., Cheng, Z., Zuo, G. Li, S. and Fan, Q., Oxidative Degradation of Fentanyl in Aqueous Solutions of Peroxides and Hypochlorites, *Defence Science Journal*, volume 61, number 1, January 2011, pp.30-35.

71 Qi, L., Cheng, Z., Zuo, G. Li, S. and Fan, Q. (2011) *op.cit.*, p.30.

72 *Note by the delegation of the Republic of Cuba addressed to the Chairperson of the Second Special Session of the Conference of the States Parties to review the operation of the Chemical Weapons Convention* (Second Review Conference), The Hague, Netherlands, RC-2/CRP.2, 8 April 2008, paragraph 2.bis.

statement to the OPCW, for example at the forthcoming 19th Conference of the States Parties (CSP), clarifying its position on these matters.

4.2.2. CZECH REPUBLIC

In 2000, the Czech military funded a research project entitled *"Analgesic-sedative and anesthetic agents used for emergency conditions – sedatives"* (MO 03021100007)[73] which was led by Dr Fusek from the Czech Army's Purkyne Military Medical Academy in Hradec Kralove. The full details of this research have not been made public. However, one of Dr Fusek's colleagues, Dr Schreiberova, an anaesthesiologist at University Hospital, Hradec Kralove, has recorded that: *"In 2000 she started cooperation with the Institute for Clinical and Experimental Medicine in Prague (Ass. Prof. Hess) and Medical Military Academy in Hradec Kralove (Prof. Fuskek)."*[74] According to Dr Schreiberova, *"the themes of these studies were anaesthesia and analgesia under specific conditions in disaster medicine and* ***the potential use of anaesthetic agents as non lethal weapons.****"* [75] [Emphasis added].

Fusek, Hess[76] and Schreiberova[77] authored a paper, presented at the 3rd Ettlingen European Symposium on Non-Lethal Weapons in early May 2005, describing their investigations over several years relating to pharmaceutical chemicals that could be employed as *"pharmacological non-lethal weapons"*.[78] The authors reported administering rhesus monkeys with various *"pharmacological cocktails"* in order to determine which combinations and doses resulted in *"fully reversible immobilization"*.[79] The paper also described how *"Fully reversible analgesic sedation was... tested in man"*, utilising the triple combination of dexmedetomidine, midazolam and fentanyl given to

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73 The original title of the project in Czech is: "*Analgosedativní a anestetické prostředky použitelné za mimořádných podmínek – SEDATIVA*". Some information is available from the Czech Republic Council for Research, Development and Innovation, at: http://www.isvav.cz/h12/resultDetail.do?rowId=RIV%2F60162694%3AG16__%2F02%3A00000625%21RIV%2F2003%2FMO0%2FG16003%2FN (accessed 20th August 2014); see also: Purkyne Military Medical Academy, Hradec Králové, *Annual Report for the academic year 2001 – 2002*, 2003, p. 24, available at: http://web.archive.org/web/20070716125230/http://www.pmfhk.cz/Akademie/vyrocnizprava02.pdf (accessed 20th August 2014).

74 Speakers biographies, *Jane's Less-Lethal Weapons 2005 Conference*, 26th – 27th October 2005, Royal Armouries Museum, Leeds, U.K. (Copy held by the authors).

75 *Ibid.*

76 Then working at the Department of Experimental Medicine, Institute for Clinical and Experimental Medicine, Prague.

77 Then working at the Department of Anesthesia, Resuscitation and Intensive Care, University Hospital, Hradec Kralove.

78 Hess, L., Schreiberova, J., and Fusek, J., Pharmacological Non-Lethal Weapons, *Proceedings of the 3rd European Symposium on Non-Lethal Weapons*, 10th -12th May 2005, Ettlingen, Germany, European Working Group on Non-Lethal Weapons, Pfinztal: Fraunhofer ICT, V23.

79 Hess, L., Schreiberova, J., and Fusek, J. (10th – 12th May 2005) *op.cit.*, pp.4-8.

patients undergoing surgery, and a second combination of dexmedetomidine, midazolam and ketamine which was tested on ten nurses.[80]

The researchers also investigated a number of alternative means of agent delivery, including via inhalation administration, which was initially tested on rats:

> *"In experiments with laboratory rats we tested using whole-glass cylinders, the effects of aerosol ketamine, medetomidine, midazolam and combinations of them as well as the opioids remifentanil, sufentanil and alfentanil. Ten minutes of inhalation resulted in a marked effect on behavior, that is, psychomotor sedation with significant ataxia."*[81]

The researchers described their subsequent inhalation experiments utilising human *"volunteers"*, which included children:[82]

> *"In a joint project with Dr Marek from Olomouc University Hospital, we tested nasal and aerosol administration of a combination of dexmedetomidine and ketamine in spray form in volunteers. Ketamine spray was administered at a dose of 0.23 mg.kg^{-1} in combination with dexmedetomidine at a dose 0.47 ug.kg^{-1}. After only several minutes of administration, we noted tranquilization of the subjects and changes in mood in terms of euphoria. Ataxia was clearly present in walking subjects. Peak effect was obtained within 30 minutes of administration.* ***Likewise, ketamine at a dose 0.25 mg.kg^{-1} with midazolam at a dose 0.5 mg.kg^{-1} were administered before venepuncture in children. A marked change in behaviour occurred within 10 minutes and the children were no longer anxious and tolerated the introduction of an i.v. cannula."***[83] [Emphasis added].

The researchers also explored trans-buccal and sub-lingual administration in cats and rhesus monkeys; and conjunctival, nasal, sub-lingual and trans-dermal administration in rabbits.[84] Although apparently not tested in these studies, the researchers consequently highlighted the potential application of paintball technology as a possible delivery mechanism:

> *"The transdermal technique of administration could possibly be used to induce long-term sedation with alpha2 agonists, benzodiazepines, and a combination of them to pacify aggressive individuals. Using the paint-ball gun principle, anesthetic-containing balls could be used. Impact of the ball would be followed by their destruction and absorption of garment with the anesthetics which will be quickly absorbed via the skin."*[85]

A shortened version of the Ettlingen paper, now entitled *"Ultrapotent Opioids as Non-Lethal Weapons"*[86], was presented by Dr Hess at an international meeting held at the Faculty of Military

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80 Hess, L., Schreiberova, J., and Fusek, J. (10th – 12th May 2005) *op.cit.*, pp.8-9.
81 Hess, L., Schreiberova, J., and Fusek, J. (10th – 12th May 2005) *op.cit.*, p.12.
82 Hess, L., Schreiberova, J., and Fusek, J. (10th – 12th May 2005) *op.cit.*, pp.11-12.
83 Hess, L., Schreiberova, J., and Fusek, J. (10th – 12th May 2005) *op.cit.*, p.12.
84 Hess, L., Schreiberova, J., and Fusek, J. (10th – 12th May 2005) *op.cit.*, pp.10-14.
85 Hess, L., Schreiberova, J., and Fusek, J. (10th – 12th May 2005) *op.cit.*, p.14.
86 Hess, L., Schreiberova, J., and Fusek, J, *Ultrapotent Opioids as Non-Lethal Weapons* paper given at: Meeting of NATO RTO TG-004, 23rd -26th May 2005, University of Defence, Faculty of Military Health Sciences,

Health Sciences, Hradec Králové, under the auspices of NATO's Research Technology Organisation (RTO) at the end of May 2005.[87] The meeting was part of an RTO Task Group on Prophylaxis and Therapy Against Chemical Agents. In their paper for the meeting, Hess, Schreiberova and Fusek stated:

> *"There is a possibility of pharmacological control of an individual behaving aggressively. The demonstration, that this is not mere science fiction, we were able to see in October 2002 during a terrorist attack at Dubrovka Theatre in Moscow, Russia. The anti-terrorist commando employed, against Chechnya terrorists, fentanyl in aerosol or its derivative to render them harmless."* [88]

Although Hess, Schreiberova and Fusek noted that *"At present, their use contradicts the conventions on the use of chemical weapons."* and *"The issue also involves numerous legal aspects"*,[89] the paper summarized the authors' attempts to investigate chemical agents that could be utilised in what they termed*"non-lethal weapons"*. The authors concluded that *"many agents used in everyday practice in anesthesiology can be employed as pharmacological non-lethal weapons.* ***An anesthetist familiar with the pharmacokinetics and pharmacodynamics of these agents is thus familiar with this use. As a result, he or she can play a role in combating terrorism."*** [90] [Emphasis added].

Hradec Kralove, Czech Republic, http://ftp.rta.nato.int/public/PubFullText/RTO/TR/RTO-TR-HFM-041/TR-HFM-041-2005-Files/PROCEEDINGS/28.htm (accessed 4th April 2014). Although this paper appears to have been removed, a copy is held by the authors.

87 The meeting of the Task Group – Prophylaxis and Therapy Against Chemical Agents HFM-041/TG-004 was held at University of Defence, Faculty of Military Health Sciences, Hradec Kralove, Czech Republic, from the 23rd -26th May 2005. The meeting comprised 54 participants from Canada, Czech Republic, France, Germany, the Netherlands, Norway, Sweden, the U.K. and the U.S. Details of the meeting programme and papers can be found in: NATO Research Technology Organisation, *Technical Report, TR-HFM-041 Prophylaxis and Therapy Against Chemical Agents*, AC/323(HFM-041)TP/280,NATO,November 2009. http://ftp.rta.nato.int/public/PubFullText/RTO/TR/RTO-TR-HFM-041/$$TR-HFM-041-ALL.pdf (accessed 4th April 2014). See, p.A.27 for inclusion of Hess presentation in meeting agenda. Abstracts or full proceeding papers and posters could be obtained from: http://ftp.rta.nato.int/public/PubFullText/RTO/TR/RTO-TR-HFM-041/TR-HFM-041-2005-Files/content.htm (accessed 7th April 2014), although this information subsequently appears to have been removed.

88 Hess, L., Schreiberova, J., and Fusek, J, (23rd -26th May 2005) op.cit., p.1.

89 Hess, L., Schreiberova, J., and Fusek, J, (23rd -26th May 2005) *op.cit.*, p.1.

90 Hess, L., Schreiberova, J., and Fusek, J, (23rd -26th May 2005) *op.cit.*, p.4.

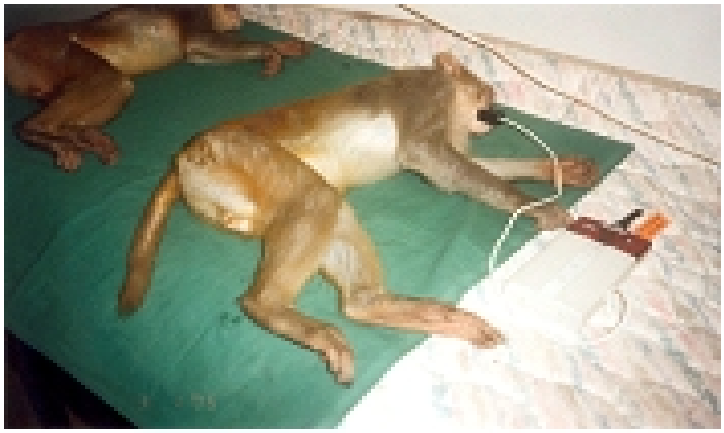

Figure 5: Image showing application of "*pharmacological cocktail*" to a Rhesus Macaque monkey. Image used in a presentation entitled *"Pharmacological Non Lethal Weapons"* by Hess, Schreiberová and Fusek; given by Dr Schreiberova at Jane's Less-Lethal Weapons Conference, 26th - 27th October 2005, Leeds, U.K.

In October 2005, Dr Schreiberova described the group's findings in a presentation – entitled *"Pharmacological Non-Lethal Weapons"* - to the Jane's Less Lethal Weapons 2005 Conference.[91] A copy of the associated power-point presentation provided details of the research methodology employed and included images of the application of the agents to a rabbit, macaque monkeys and human subjects.[92] One slide is entitled "*Inhalation and nasal analgosedation in children"* and has an image of a child in a hospital bed.[93]

In 2005, Schreiberova, Hess, Marcus and Joostens[94] published a summary paper in the *European Journal of Anaesthesiology* which argued that *"After the rapid incapacitation of persons in Moscow theatre ended in disaster…*,[it was] *"probably wise to educate and involve anaesthesiologists in the search of rapid and safe forms of immobilization suitable for disaster medicine."*[95] The researchers noted that "*some research is published about the use of benzodiazepines, opioids and alpha 2 agonists for induction of totally reversible immobilization in small laboratory animals."* [96] They argued that: *"If such a combination is suitable for immobilization in man, it should be tested in*

91 Hess, L., Schreiberova, J., and Fusek, J., *Pharmacological Non-Lethal Weapons, Jane's Less-Lethal Weapons 2005 Conference*, 26th – 27th October 2005, Royal Armouries Museum, Leeds, U.K.

92 Hess, L., Schreiberova, J., and Fusek, J., *Pharmacological Non-Lethal Weapons*, power point presentation given by Dr Schreiberova at Jane's Less-Lethal Weapons 2005 Conference, 26th – 27th October 2005, Royal Armouries Museum, Leeds, U.K. [Copy held by the authors].

93 Hess, L., Schreiberova, J., and Fusek, J., *Pharmacological Non-Lethal Weapons*, [power point presentation] (October 2006) *op.cit.*, slide 32. (Copy held by the authors).

94 Then working at the Department of Anaesthesiology and Intensive Care Medicine, Charles University and Faculty Hospital, Hradec Kralove, Czech Republic.

95 Schreiberova, J., Hess, L., Marcus, M., Joostens, E., A search for safe and rapid method of immobilization. A study in macague monkeys: A-694, *European Journal of Anaesthesiology*, May 2005, volume 22, p.180.

96 Schreiberova, J., Hess, L., Marcus, M., Joostens, E. (2005) *op.cit.*, p.180.

Macaque monkey first, because of its similarity to man concerning the sensitivity to respiratory depression."[97]

Consequently, the researchers administered a group of ten Macaque monkeys with an injection containing the combination of midazolam, medetomidine and fentanyl. Rapid immobilisation was reportedly achieved with no severe respiratory depression or cardiovascular instability during the study period. The researchers concluded that *"The present method of totally reversible immobilization is reliable, rapid and safe method in Macaque monkey. Our results encourage similar studies in healthy volunteers."* [98]

Figure 6: Image showing loss of aggression in Rhesus Macaque monkey following application of a combination of ketamine, naphtylmedetomidine and hyaluronidase. Taken from a research paper entitled: *Drug-Induced Loss of Aggressiveness in the Macaque Rhesus* by Hess, Schreiberová, Málek, Votava and Fusek, given at 4th European Symposium on Non-Lethal Weapons, 21st-23rd May 2007.

In 2007, in a paper authored by Hess, Schreiberová, Fusek, Málek[99] and Votava[100], which was presented at the 4th Ettlingen European Symposium on Non-Lethal Weapons, the researchers described how they *"decided to test new combinations* [of drugs] *for suppression or complete abolition of aggressive behaviour"* in macaque monkeys.[101] The researchers stated that: *"All tested combinations resulted in macaques in reduction or complete loss of aggressiveness. Optimal combinations was naphtylmedetomidine + dextrorotatory isomer of ketamine + hyaluronidase. The*

97 Schreiberova, J., Hess, L., Marcus, M., Joostens, E. (2005) *op.cit.*, p.180.
98 Schreiberova, J., Hess, L., Marcus, M., Joostens, E. (2005) *op.cit.*, p.180.
99 Department of Anaesthesiology and Intensive Care, 3rd Medical faculty, Charles University in Prague, Czech Republic.
100 Pharmacology Department, 3rd Medical faculty, Charles University in Prague, Czech Republic.
101 Hess, L., Schreiberová, J., Málek, J., Votava, M., Fusek, J., Drug-Induced Loss of Aggressiveness in the Macaque Rhesus, *Proceedings of 4th European Symposium on Non-Lethal Weapons*, 21st-23rd May 2007, Ettlingen, Germany, European Working Group on Non-Lethal Weapons, Pfinztal: Fraunhofer ICT, V15, p.6.

onset of effect was rapid and we achieved complete manipulability of the animal with low motoric sedation." [102] Furthermore, the researchers argued that: *'**the results can be used to pacify aggressive people during** medical treatment (mental disease), **terrorist attacks and during** **[sic] production of new pharmacological nonlethal weapons.**'*[103] [Emphasis added].

The papers given at the NATO RTO Task Group meeting, the Jane's Less Lethal Weapons Conference and the two Ettlingen European Non-Lethal Weapons Symposia, appeared to present the research findings in terms of their potential applicability to the development of what the authors called *"pharmacological non-lethal weapons"*. Other papers by Czech researchers into the application of chemical agents for the treatment of aggressive states or to induce immobilization contained no explicit reference to their potential application as such so-called *"non-lethal weapons"*. However, the potential applicability of this research to the study or development of ICA weapons is clear.

For example, a 2008 paper by Votava, Hess, Schreiberová and Malek entitled *"The behavioural and cardiovascular effects of a novel partial alpha2-adrenoceptor agonist naphthylmedetomidine* [NFT]*"*[104] summarised the authors' studies of NFT application to monkeys and rabbits. It concluded that:

> *"The antiaggressive effect of NFT is more selective than that observed with other agents, suggesting [a] promising role of partial alpha-2 AR agonists in the treatment of aggressive states or in pharmacological immobilization. NFT is almost devoid inhibition of cardiorespiratory functions, which has a significant impact in human and veterinary medicine and thus it offers advantage over the routinely used alpha-2 AR agonists."*[105]

102 Hess, L. Schreiberová, J., Málek, J., Votava, M., Fusek, J. (2007) *op.cit.*, p.7.

103 Hess, L. Schreiberová, J., Málek, J., Votava, M., Fusek, J. (2007) op.cit., p.7.

104 Votava, M., Hess, L., Schreiberova, J. Malek, J. The behavioral and cardiovascular effects of a novel partial alpha-2 adrenoceptor agonist Naphthylmedetomidine, *European Neuropsychopharmacology*, volume 18, supplement 4, August 2008, pp.S383–S384, *Papers of the 21st ECNP Congress*. A slightly revised version of this paper was published as: Votava, M., Hess, L., Schreiberová, J. and Málek, J., P.1.14 Antiaggressive and sedative effect of alpha2-adrenoceptor agonist naphthylmedetomidine in rabbits and monkeys, *European Neuropsychopharmacology*, January 2009; volume 19, pp.S141-142. In addition, see: Votava, M., Hess, L., Kriak, M. The effect of different alpha-2 adrenoceptor ligands on aggression in mice, *European Neuropsychopharmacology*, volume 18, supplement 4, August 2008, p.S383.

105 Votava, M., Hess, L., Schreiberova, J., Malek J. (2008) *op.cit.*, p.S384.

Figure 7: Images showing immobilization of an orang-utan (Left) and a chimpanzee (Right) using a combination of naphthylmedetomidine, ketamine and hyaluronidase. Taken from the 2010 research paper: *"Experience with a naphthylmedetomidine - ketamine - hyaluronidase combination in inducing immobilization in anthropoid apes"* by Hess, Votava, Schreiberová, Málek and Horáček.

In July 2010, Hess, Votava, Schreiberová, Málek and Horáček, published a further paper describing their studies inducing immobilization in orangutans and chimpanzees utilising a naphthylmedetomidine-ketamine-hyaluronidase combination.[106] Subsequent papers by Votava, Hess, Schreiberová, Málek, and Štein on *"short term pharmacological immobilization in macaque monkeys"*[107], and by Hess, Votava, Slíva, Málek, Kurzová, and Štein, exploring the effects of ephedrine on *"psychomotor recovery from anesthesia in macaque monkeys"*[108] were published in 2011 and 2012 respectively. Once again, although the results of these later studies were presented in terms of facilitating the relocation and painless medical examination of the animals, such research may also potentially be applicable to the study or development of weapons employing incapacitating chemical agents.

In February 2014, a review paper entitled *"Incapacitating chemicals – Risk to the purpose and objectives of the Chemical Weapons Convention?"*[109] co-authored by Mr Streda – formerly Head of the Czech Republic's Chemical Weapons Prohibitions Division, and Professor Patocka – formerly from the Department of Toxicology, Military Medical Academy, Hradec Králové, was published in *KONTAK: Section biomedicine, bioethics and allied professionals*. As part of their wide-ranging

106 Hess, L., Votava, M., Schreiberová, J., Málek, J., Horáček, M., Experience with a naphthylmedetomidine - ketamine - hyaluronidase combination in inducing immobilization in anthropoid apes, *Journal of medical primatology*, volume 39, number 3, June 2010, pp.151-159.

107 Votava, M., Hess, L., Schreiberová, J., Málek, J., Štein, K., Short term pharmacological immobilization in macaque monkeys, *Veterinary Anaesthesia and Analgesia*, volume 38, issue 5, September 2011, pp.490–493.

108 Hess, L., Votava, M., Slíva, J., Málek, J., Kurzová, A., Štein, K., Ephedrine accelerates psychomotor recovery from anesthesia in macaque monkeys, *Journal of Medical Primatology*, volume 41, issue 4, August 2012, pp. 251–255.

109 Incapacitating chemicals – Risk to the purpose and objectives of the Chemical Weapons Convention? Streda, L. and Patocka, J., *KONTAK: Section biomedicine, bioethics and allied professionals*, volume 16, February 2014, pp.57-63.

analysis of incapacitating chemical agents, the authors undertook an *"unofficial investigation"* of the concerns raised regarding Czech research in this area. *"In the framework of the unofficial investigation, the Czech side has been asked for science publications of the Military Medical Academy and for some civilian research organizations including articles from popular journals."* [110] In addition, the paper cited *"the unofficial statement from the permanent representative of the Czech Republic to the OPCW which was made in 2007, when the Czech side was asked for a statement about what were at that time called ''non-lethal chemical agents''.*[111] According to the KONTAK article, the permanent representative of the Czech Republic stated that: *"No research into drugs which could be used as so-called ''non-lethal weapons'' nor as agent pro [sic] law enforcement is performed in the Czech Republic."*[112] Furthermore, the permanent representative reportedly declared:

> *"In the Czech Republic the official position of the experts working here, including …Czech representatives acting in the Organisation for the Prohibition of Chemical Weapons, support the uniform view that essentially denounces research into the so-called ''non-lethal weapons''. They have expressed this consistent view many times in science forums and relevant publications."* [113]

On 14th July 2014, in correspondence to BNLWRP, the Czech CWC National Authority stated:

> *"The purpose of the research into toxicological properties of some incapacitating agents with code numbers MO 0302 11 00007, Grant Agency: Ministry of Defence, and Project Number: NR/8508-3/05 Grant Agency: Ministry of Health was purely medical such as for combating pain in incurable patients, easing anxiety during medical procedures or helping with treatment of non-cooperative or aggressive patients, as well as developing cocktail of anaesthetics usable in treating of high number of casualties during mass disasters. All these goals are fully legitimate, and as they are not considered as research for protective purposes against chemical weapons, they are not reportable to the Technical Secretariat of the OPCW."*[114]
>
> *"The toxic chemical substances, used in the research projects are not produced in the Czech Republic. They were acquired via regular pharmaceutical distribution net, providing medicaments for the medical practitioners...All equipment used for implementation of anaesthetics during the experiments were standard medical instruments..."*[115]
>
> *"Both the research programs are missing the very basic components proving that they were being aimed at the development of any sort of chemical weapons or a means of riot control (respectively anti-terrorist tool) such as: delivery systems, usable for creating necessary concentration of toxic agent in enclosed or open areas*

110 Streda, L. and Patocka, J., (2014) *op.cit.*,p.e.61.
111 Streda, L. and Patocka, J., (2014) *op.cit.*,p.e.62.
112 Streda, L. and Patocka, J., (2014) *op.cit.*,p.e.62.
113 Streda, L. and Patocka, J., (2014) *op.cit.*,p.e.62.
114 Czech Republic, National Authority of the CWC, *Reply to the University of Bradford, Re: Request for information concerning research potentially related to incapacitating chemical agents*, 14th July 2014, p.6.
115 Czech Republic (14th July 2014) op.cit., p.3.

> *… [e.g.] high capacity aerosol generator or explosive dispersion devices...or development of a methodology for use of incapacitating agents in field condition...”*[116]

The CWC National Authority categorically declared that: *“There was no connection of the research with creation of any sort of weapons or devices which could be used for military or police purposes.”*[117]

With regard to publications by Czech researchers which appeared to frame their research findings in terms of the potential development of *“pharmacological non-lethal weapons”*, the CWC National Authority stated:

> *“We interviewed principal authors of the projects and subsequent publications referring to incapacitation chemical weapons.* ***We came to conclusion that their research programmes had justifiable medical goals, but their reporting in public media exceeded actual results of the research thus creating a false impression of possible development of some sort of chemical weapons.”*** *[Emphasis added]*[118].

Furthermore, the CWC National Authority stated:

> *“Publications referring to the possible use of opioids, anaesthetics and other toxic chemicals with incapacitating effects as chemical weapons [were] based solely on approximation of this legitimate research of the properties of these chemicals into the area [of] possible misuse.”*[119]

> *“Based on these findings, we organised several presentations for the Ministry of Health, the Ministry of Defence and the Ministry of the Interior with the aim to improve their knowledge of the Convention and the National Legislation for its implementation. We put emphasis on to the prohibition of development of any sort of chemical weapons, the area of riot control agents as well as their responsibility to report any development of a novel riot control agent to the Czech National Authority.”*[120]

On 4th August 2014, in further correspondence with BNLWRP, the Czech CWC National Authority clarified interpretation of its national implementing legislation - *Act No. 19/1997, On Some Measures Concerning Chemical Weapons Prohibition*[121] with regard to incapacitating chemical agents. The Czech CWC National Authority confirmed that:

> *“Czech ACT No. 19/1997 exactly defines and regulate[s] the properties and handling of the riot control agents.* ***This definition does not include ICA, and in its***

116 Czech Republic (14th July 2014) op.cit., p.4.
117 Czech Republic (14th July 2014) op.cit., p.4.
118 Czech Republic (14th July 2014) op.cit., p.5.
119 Czech Republic (14th July 2014) op.cit., p.6.
120 Czech Republic (14th July 2014) op.cit., p.5.
121 Czech Republic, ACT No. 19/1997 of 24 January 1997 On Some Measures Concerning Chemical Weapons Prohibition, http://www.sujb.cz/fileadmin/sujb/docs/legislativa/zakony/A19_97.pdf (accessed 4th August 2014).

consequence prohibits their use for the law enforcement. This is our long-standing position in relation to the ICA.*"[Emphasis added].*[122]

BNLWRP welcomes the substantial and detailed response by the Czech CWC National Authority concerning research by Czech scientists into drugs which potentially could be employed as ICA weapons and the associated publications of these scientists which appeared to frame this work in terms of their potential application as so-called *"pharmacological non-lethal weapons"*. The case clearly demonstrates how misperceptions with regard to the intentions behind such research can arise. The actions taken by the Czech CWC National Authority to investigate this matter and address the attendant risk of misperception are to be welcomed. To increase clarity on this issue, it would be beneficial if the Czech Republic made a formal public statement to the OPCW, for example at the forthcoming 19th CSP, confirming the national prohibition on the development, acquisition, stockpiling or use of ICAs or other toxic chemicals (save RCAs) for law enforcement purposes.

4.2.3. INDIA

To date, there is no evidence that India has developed weapons employing incapacitating chemical agents for law enforcement or military purposes. However, a review of publicly available scientific papers indicates that researchers at the Defence Research & Development Establishment (DRDE) of the Defence Research & Development Organisation (DRDO) have undertaken wide-ranging research into the synthesis, aerosolisation and bio-efficacy of fentanyl and/or its analolgues.[123]

In 2005, DRDE/DRDO researchers Gupta, Ganesan, Pande and Malhotra published a paper detailing *"a straightforward one pot synthesis of fentanyl"* that involved tandem reductive alkylation and amination reactions in the presence of sodium triacetoxyborohydride (STAB) followed by an N-acylation reaction.[124] The authors stated that the method was *"very simple and efficient"*. The whole reaction would take place *"under mild conditions and at room temperature"*.

122 Email correspondence to Dr M. Crowley, BNLWRP, from Mr J. Straka, Department for Chemical Weapons Prohibition, Czech Republic, 4th August 2014. See also analysis of *Act No. 19/1997* by Streda and Patocka in which they concluded: „"*...the country's existing legal regulations forbid usage of incapacitating chemicals for law enforcement purposes and, in conformity with the objectives of the Convention, also for military usage."* Streda, L. and Patocka, J., (2014) *op.cit.*,p.e.63.

123 Furthermore, a number of personnel engaged in fentanyl research at DRDE/DRDO have also undertaken research whilst at DRDE/DRDO, related to synthesis and analysis of riot control agents. See for example: Pande, A. , Ganesan, K., Jain, A.K., Gupta, P.K., and Malhotra, R.C. A novel eco-friendly process for the synthesis of 2-Chlorobenzylidenemalononitrile and its analogues using water as a solvent, *Organic Process Research & Development*, volume 9, issue 2, 21st January 2005, pp.133–136; Gutch, P.,K., Kumar, P., Suryanarayana, M.V.S., and Malhotra, R.C. Structure-biological activity relationship of analogues of 2-Chlorobenzylidenemalononitrile -a riot-control agent, *Defence Science Journal*, volume 55, number 4, October 2005, pp.447-457; and Gutch, P.K. And Acharya, J. A simple, convenient and effective method for the synthesis of Dibenz(B,F) 1,4-Oxazepines (CR); a new generation riot control agent and its analogues. *Heterocyclic Communications*, volume 13, issue 6, December 2007, pp.393-396.

124 Gupta P K, Ganesan K, Pande A, Malhotra R C. A convenient one-pot synthesis of fentanyl. *Journal of Chemical Research*, July 2005, pp.452-453.

[125] By means of these three successive one pot reactions, separation and purification of the intermediates were excluded, thereby increasing the overall yield. The authors stated that this *"method can also be used for the synthesis of fentanyl analogues."* [126]

Work on fentanyl synthesis continued, and in March 2009 the DRDO applied for a European patent for *"A method for the preparation of fentanyl"*. The patent, which was subsequently granted in November 2013[127], stated that: *"This invention particularly relates a method that is simple, high-yeilding, cost effective, eco-friendly, environmentally safe, industrially feasible, does not require stringent process conditions, sophisticated infrastructure and specially skilled personnel.[128]* DRDO also applied for and was granted similar patents for this method of fentanyl preparation in Australia[129] and the United States.[130]

In 2008, a paper by Gupta, Ganesan, Gutch, Manral, and Dubey described the application of thermogravimetry techniques for the estimation of vapour pressure and related thermodynamic properties of fentanyl.[131] The paper concluded that the methods employed provided a "*simplified and fast method for a preliminary screening of the vapour pressure of narcotic analgesics like fentanyl."[132]* The paper highlighted the importance of such data *"for understanding and modelling the thermal aerosol formation of fentanyl which in turn is required for the development of its aerosol delivery system."[133]*In 2009, a paper by Manral, Gupta, Suryanarayana, Ganesan, and Malhotra detailed the group's investigations utilising flash pyrolysis to explore the thermal behaviour of fentanyl at different temperatures[134], and noted that the study *"will be useful while developing technologies for thermal aerosol generation of fentanyl and related compounds."[135]*

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125 Gupta P K, Ganesan K, Pande A, Malhotra R C. (July 2005) *op.cit*, p.452.
126 Gupta P K, Ganesan K, Pande A, Malhotra R C. (July 2005) *op.cit*, p.452.
127 European Patent Specification, EP 2 252 149 B1, *A method for the preparation of fentanyl*, Gupta P.K., Manral, L., Ganesan, K. Malhotra, R.C. and Sekhar K. patent granted 20th November 2013.
128 European Patent Specification, EP 2 252 149 Bi (20th September 2013) *op.cit.*, paragraph 0001.
129 Australian Patent AU2009227521, *A method for the preparation of fentanyl*, 7th October 2010, http://www.ipaustralia.com.au/applicant/director-general-defence-research-and-development-organisation/patents/AU2009227521/ (accessed 1st May 2014).
130 Patent Issued for Method for the Preparation of Fentanyl, Biotech Week, 3rd April 2013, http://www.highbeam.com/doc/1G1-325261259.html (accessed 1st May 2014). For: U.S. Patent Application No: 2011/0021,781, Method for the Preparation of Fentanyl see: http://www.patentbuddy.com/Patent/20110021781 (accessed 1st May 2014).
131 Gupta, P.K., Ganesan, K., Gutch, P.K., Manral, L. and Dubey, D.K., Vapor Pressure and Enthalpy of Vaporization of Fentanyl, *Journal of Chemical & Engineering Data*, volume 53, number 3, 2008, pp.841-845.
132 Gupta, P.K., Ganesan, K., Gutch, P.K., Manral, L. and Dubey, D.K. (2008) *op.cit.*, p.844.
133 Gupta, P.K., Ganesan, K., Gutch, P.K., Manral, L. and Dubey, D.K. (2008) *op.cit.*, p.844.
134 Manral, L., Gupta, P.K., Suryanarayana, M.V.S., Ganesan, K. and Malhotra, R.C. Thermal behaviour of fentanyl and its analogues during flash pyrolysis, *Journal of Thermal Analysis and Calorimetry*, May 2009, volume 96, issue 2, pp.531-534.
135 Manral, L., Gupta, P.K., Suryanarayana, M.V.S., Ganesan, K. and Malhotra, R.C. (May 2009) *op.cit.*, p.531.

In 2009, a paper by Manral, Muniappan, Gupta, Ganesan, Malhotra and Vijayaraghavan documented their work exploring exposure to aerosolised fentanyl in mice.[136] The authors noted that *"To the best of our knowledge, the effect of inhaled fentanyl on breathing pattern, respiratory frequency, and tidal volume of respiration has not yet been reported."*[137] The authors undertook the study *"with a view to determine the effect of fentanyl aerosols on the breathing pattern of mice during and after exposure and to estimate a safety limit."*[138] The researchers reported that *"on exposure to fentanyl aerosol, a decrease in the respiratory rates of mice was observed, which recovered when exposure stopped. Mortality occurred on exposure to higher concentrations of fentanyl aerosols."* [139] They concluded that *"Although fentanyl aerosol did not cause any sensory and pulmonary irritation and since the RD_{50} and LC_{50} are very close, indicating a low safety margin, this type of sedative should not be used as an incapacitating agent."* [140]

Work by DRDO/DRDE researchers related to the synthesis and bio-efficacy of fentanyl and its analogues continued in collaboration with researchers from other organisations. In 2010, a paper by Yadav, Chauhan, Ganesan, Gupta, Chauhan and Gokulan described their review of alternate methods for synthesising fentanyl and their work to determine the Structure-Activity-Relationship (SAR) of fentanyl analogs.[141] Subsequently, a 2013 paper by Gupta, Yadav, Bhutia, Singh, Rao, Gujar, Ganesan and Bhattacharya[142] described the synthesis of four fentanyl analogues: N-(1-propyl-4-piperidinyl) propionanilide, N-(1-(2-phenoxyethyl)-4-piperidinyl) propionanilide , N-(1-(3-phenoxypropyl)-4-piperidinyl) propionanilide, and N-(1-(2-cyanoethyl)-4-piperidinyl) propionanilide – formed from the replacement of the phenyl group of the phenethyl chain of fentanyl with alkyl, ethereal and nitrile moieties. The analogues were subsequently evaluated for their bio-efficacy. The study "*reveals that replacing the phenyl group of* [the] *phenethyl tail of*

136 Manral, L, Muniappan, N., Gupta, P.K., Ganesan, K., Malhotra, R.C, Vijayaraghavan, R., Effect of exposure to fentanyl aerosol in mice on breathing pattern and respiratory variables, *Drug and Chemical Toxicology*, 2009; volume 32, issue 2, pp.108-13.

137 Manral, L., Muniappan, N., Gupta, P.K., Ganesan, K., Malhotra, R.C., Vijayaraghavan, R. (2009) *op.cit*., p.109.

138 Manral, L., Muniappan, N., Gupta, P.K., Ganesan, K., Malhotra, R.C., Vijayaraghavan, R. (2009*) op.cit*., p.109.

139 Manra,l L., Muniappan, N., Gupta, P.K., Ganesan, K., Malhotra, R.C., Vijayaraghavan, R. (2009*) op.cit*., p.112.

140 Manral, L., Muniappan, N., Gupta, P.K., Ganesan, K., Malhotra, R.C., Vijayaraghavan, R. (2009) *op.cit.*, p.112.

141 Yadav, P., Chauhan, J.S. Ganesan, K., Gupta, P.K., Chauhan, D. Gokulan, P.D., Synthetic methodology and structure activity relationship study of N-[1-(2-phenylethyl)-piperidin-4-yl]-propionamides, *Pelagia Research Library Der Pharmacia Sinica*, 2010, volume 1, issue 3, pp.126-139.

142 Gupta, P.K., Yadav, S.K., Bhutia, Y.D., Singh, P., Rao, P. Gujar, N.L., Ganesan, K., Bhattacharya, R., Synthesis and comparative bioefficacy of N-(1-phenethyl-4-piperidinyl) propionanilide (fentanyl) and its 1-substituted analogs in Swiss albino mice, *Medicinal Chemistry Research*, August 2013, volume 22, issue 8, pp. 3888-3896.

fentanyl with different functional groups results in decreased toxicity of the molecules without sacrificing their potency. Thereby, enhanced therapeutic index could be achieved."[143]

In addition to these studies, DRDE/DRDO researchers have also published papers assessing the application of potential methods for the detection and identification of the presence of fentanyl or its analogues in environmental samples: through the use of single drop micro-extraction[144], and the application of gas chromatographic retention indices.[145]

Although a number of the published papers have highlighted the application of fentanyl for analgesia in a medical context, the specific purposes behind the DRDE/DRDO research activities were not specified, and the intended uses to which the resultant chemicals would be put, remain unclear. Legitimate questions can be raised given that these activities have taken place under the auspices of the Defence Research & Development Organisation (DRDO). According to its website, DRDO:

> *"works under Department of Defence Research and Development of Ministry of Defence...towards enhancing self-reliance in Defence Systems and undertakes design & development leading to production of world class weapon systems and equipment in accordance with the expressed needs and the qualitative requirements laid down by the three services."*[146]

Furthermore, the website stated that DRDO is "***working in various areas of military technology which include*** *...armaments...advanced computing, simulation and* ***life sciences."*** *[Emphasis added]*. In addition, the website noted that ***"****DRDO while striving to meet the cutting edge weapons technology requirements provides ample spinoff benefits to the society at large thereby contributing to the nation building."*[147]

Further insight into the intentions behind the DRDE/DRDO work on fentanyl and related pharmaceutical chemicals may be gained from analysing the biographical data available on DRDE personnel working on these or other DRDE/DRDO projects. For example, contributors to a 2007 paper detailing "*rapid solvent-free synthesis of aromatic hydrazides under microwave irradiation"*[148] included: "*Dr Pradeep K. Gupta* ... [who] *joined DRDE, Gwalior, in 2003. He is*

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143 Gupta, P.K., Yadav, S.K., Bhutia, Y.D., Singh, P., Rao, P. Gujar, N.L., Ganesan, K., Bhattacharya, R. (2013) *op.cit.*, p.3889.

144 Gupta, P.K., Manral, L. Ganesan, K. and Dubey D.K., Use of single-drop microextraction for determination of fentanyl in water samples, *Analytical and Bioanalytical Chemistry*, June 2007, volume 388, issue 3, pp. 579-583.

145 Manral, L., Gupta P.K., Ganesan, K. and Malhotra R.C., Gas chromatographic retention indices of fentanyl and analogues, *Journal of Chromatographic Science*, July 2008, volume 46, issue 6, pp.551-5.

146 Website of the Defence Research & Development Organisation, Ministry of Defence, Government of India, http://www.drdo.gov.in/drdo/English/index.jsp?pg=homebody.jsp (accessed 1st May 2014).

147 Website of the Defence Research & Development Organisation, Ministry of Defence, Government of India, http://www.drdo.gov.in/drdo/English/index.jsp?pg=homebody.jsp (accessed 1st May 2014).

148 Jain, A.K., Gupta, P.K., Ganesan, K., Pande, A. and Malhotra, R.C., Rapid Solvent-free Synthesis of Aromatic Hydrazides under Microwave Irradiation, *Defence Science Journal*, volume 57, number 2, March 2007, pp. 267-270.

presently working as Scientist B in Synthetic Chemistry Division. ***His area of work is synthesis and process development of non-lethal incapacitating agents."*** [Emphasis added]. Subsequently, the April 2010 edition of the *DRDO Newsletter*, the organisation's *"monthly house bulletin"*[149], recorded that among those who received a formal DRDO Award in 2009 was *"Dr Pradeep K Gupta, Sc 'C', Defence Research & Development Establishment (DRDE), Gwalior"* who was granted this award in recognition of his *"significant contributions towards* ***synthesis and optimisation of up-scaling fentanyl and other non-lethal incapacitating agents."***[150] [Emphasis added].

On 22nd July 2014, in correspondence to BNLWRP, the Indian CWC National Authority declared that: *"India does not hold any stockpiles of weapons involving ICAs"*.[151] Furthermore, *"India does not conduct research in order to develop weapons ICAs"*, nor does it *"conduct research related to weaponisation of incapacitating agents"* for defensive purposes such as the development of counter-measures.[152] In its response, the Indian CWC National Authority did confirm that *"DRDE/DRDO undertakes research into fentanyl and its analogues"* but that this was *"only for purposes of characterization including its detection and protection aspects."*[153]

On 7th August 2014, in further correspondence to BNWLRP, Dr Trivedi, Chair of the Indian CWC National Authority forcefully underlined the Authority's *"categorical and unambiguous clarifications"* that India has no stockpile of ICAs, is not involved in the weaponisation of ICAs and that *"research on fentanyl is being carried out in India only for the purpose of protection."*[154] The clarifications by the Indian CWC National Authority into the activities of DRDE/DRDO are to be welcomed, and further information as to the nature of activities related to *"synthesis and optimisation of up-scaling fentanyl and other non-lethal incapacitating agents"*, as highlighted in the *DRDO Newsletter,* would be beneficial. It is not known whether the activities described in this case study have been reported to the OPCW in any of India's annual declarations of national programmes related to protective purposes[155], and further clarification would be welcome.

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149 *DRDO Newsletter*, volume 30, number 4, April 2010, Defence Research & Development Organisation, http://drdo.gov.in/drdo/pub/newsletter/2010/apr_10.pdf (accessed 1st May 2014).

150 DRDO Newsletter (April 2010) *op.cit.*, p.12.

151 Correspondence to Dr M.Crowley, BNLWRP, from R.K. Singh, Deputy Chief of Mission, Embassy of India, The Hague, forwarding the response of the Indian CWC National Authority, 22nd July 2014.

152 Indian CWC National Authority (22nd July 2014) *op.cit.*

153 Indian CWC National Authority (22nd July 2014) *op.cit.*

154 Correspondence to Dr M.Crowley BNLWRP, from Dr P. Trivedi, Secretary (Performance Management) Government of India and Chairman, Indian National Authority for the Chemical Weapons Convention, 7th August 2014.

155 See: OPCW, Chemical Weapons Convention, (1993) op.cit., Article X, particularly paragraphs 2-4

The use of any toxic chemical as a weapon in armed conflict is absolutely prohibited under international law including the CWC and customary IHL. India, as a member of the Non-Aligned Movement (NAM) would presumably align itself to the *"Proposal by the NAM CWC States Parties and China on the Draft Report of the Second Review Conference."* The paper recommended that the Conference should "*categorically condemn*[ed] *the use of chemical weapons including incapacitating agents or riot control agents as a method of warfare by any state, group or individual under any circumstances."*[156] To date, however, India has not declared whether it considers the development, acquisition, stockpiling or use of ICA weapons for law enforcement purposes to be permissible under the CWC and relevant international law. It would be beneficial if India made a formal statement to the OPCW, for example at the forthcoming 19th CSP, clarifying its position on these matters.

4.2.4. IRAN

To date, there is no evidence that Iran has developed weapons employing incapacitating chemical agents for law enforcement or military purposes. A review of publicly available scientific papers does indicate that a group of researchers based in the Department of Chemistry at Imam Hossein University (IHU) have undertaken research related to fentanyl analogues and the aerosolisation of medetomidine which potentially has multiple applications.[157]

In 2007, at an international symposium on computational methods in toxicology and pharmacology, held in Moscow, researchers from IHU gave an oral presentation summarising their application of structure-activity relationship study techniques to fentanyl and its analogues.[158] A fuller description of this research appeared in a paper published by Nezamoleslam, Javahery, Nahad and Fakhraian in 2010.[159] According to the authors *"the effect of the main 5 groups contributing to the analgesic activity of fentanyl analogues (70 compounds) are investigated. The best groups have been*

156 *Note by the delegation of the Republic of Cuba addressed to the Chairperson of the Second Special Session of the Conference of the States Parties to review the operation of the Chemical Weapons Convention* (Second Review Conference), The Hague, Netherlands, RC-2/CRP.2, 8 April 2008, paragraph 2.bis.

157 In addition, one of the researchers involved in this work, Dr Fakhraian, has also undertaken research into riot control agents. See: Fakhraian, H., Nafary, Y., Yarahmadi, A. and Hadj-Ghanbary, H. Improved etherification procedure for the preparation of dibenz[b,f][1,4]oxazepine, *Journal of Heterocyclic Chemistry*, volume 45, issue 5, pp.1469-1471, September/October 2008; Fakhraian, H. and Nafary, Y. Reinvestigation of alternative method for the preparation of dibenz[b,f][1,4]oxazepine, *Journal of Heterocyclic Chemistry*, volume 46, issue 1, pp.988-992, August 2009.

158 Fakhraian, H., Nezamoleslam, T., Panbehriseh, M.B., and Javahery, B., Structual-activity relationship, atomic electron density and conformational investigation of fentanyl analogues, summary of oral presentation in: *Fourth International Symposium Computational Methods in Toxicology and Pharmacology Integrating Internet Resources in 2007 symposium proceedings*, Moscow, 2007

159 Nezamoleslam, T., Javahery, B., Shakiba, N., Fakhraian, H. Structure-activity relationship, atomic electron density and conformational investigation of fentanyl analogues. *Journal of Passive Defence Science & Technology*, issue 1, 2010, pp.23-32. The paper is in Farsi; the extracts cited are from an unofficial English translation.

determined and the most effective fentanyl analogue has been proposed." [160] Neither the purpose of this research, nor how its findings were to be applied has been made clear. However, in the paper abstract the authors highlighted the potential military application: *"Fentanyl and its analogues are highly potent and clinically widely used as narcotic analgesics and represent a particular class of Ï agonist. These compounds are known as non-lethal chemical warfare agents."*[161] In the paper's preface, the researchers stated that *"multiple military and disciplinary uses of fentanyl have been reported"*, and cited papers discussing the Russian Federation use of an ICA in October 2002.[162]

In 2010, Mr Kamranpey completed his Msc thesis at Imam Hossein University entitled *"Aerosolization of Hydrochloride Salts of Medetomidine, Ketamine, and Propranolol"*.[163] In 2011, Mr Kamranpey published a paper describing *"the preparation and optimization of spray formulation and aerosolization of an incapacitating drug of medetomidine hydrocholoride."*[164] In this paper, the author investigated spray formulations of medetomidine hydrocholoride, a thickening agent (Span 85), and a propellant (propane) at different concentrations utilising alternate solvents, so as to form a single-phase mixture in order to generate a stable aerosol. An optimal spray solution of 5.5% medetomidine hydrochloride was prepared which *"resulted in aerosols with very good environmental stability that were completely spread out in the air in the form of a cloud of very tiny particles, and absorption onto the walls of the container was not observed for several hours."*[165]

The author noted that *"Aerosolization technology is used in different fields such as industry, the military, agriculture, cosmetics, health and especially medicine and the preparation of drug sprays*".[166] With regard to the potential incapacitating agent medetomidine hydrochloride, Mr Kamranpey noted that it is *"the most powerful Alpha 2 Agonist which is applied in clinical use*".[167] And that *"use of this drug facilitates minor and short-term surgical operations (without any need for anaesthesia)."*[168] Furthermore, Kamranpey noted that the drug *"has also been used as an incapacitating drug for the tranquillization of wild animals."*[169] Kamranpey does not explicitly state the intention behind his research to develop a stable, long-lasting medetomidine aerosol nor its proposed applications. Although medetomidine is employed for certain medical and veterinary

160 Nezamoleslam, T., Javahery, B., Shakiba, N., and Fakhraian, H. (2010) *op.cit.*
161 Nezamoleslam, T., Javahery, B., Shakiba, N., and Fakhraian, H. (2010) *op.cit.*
162 Nezamoleslam, T., Javahery, B., Shakiba, N., and Fakhraian, H. (2010) *op.cit.*
163 Kamranpay, H. Aerosolization of Hydrochloride Salts of Medetomidine, Ketamine, and Propranolol, Imam Hossein University, M.Sc. Thesis, 2010.
164 Kamranpey, H. Aerosolisation of medetomidine hydrochloride as an incapacitating agent. *Journal of Passive Defence Science & Technology*, issue 3, 2011, pp.51-56. The paper is in Farsi; the extracts cited are from an unofficial English translation.
165 Kamranpey, H. (2011) *op.cit.*, p.56.
166 Kamranpey, H. (2011*) op.cit.*, p.56.
167 Kamranpey, H. (2011) *op.cit.*, p.56.
168 Kamranpey, H. (2011) *op.cit.*, p.56.
169 Kamranpey, H. (2011) *op.cit.*, p.56.

purposes, the drug is applied intravenously or intramuscularly. The current authors could find no reference to standard medical or veterinary application of medetomidine through inhalation of an aerosol.

Additional research related to Mr Kamranpey's work has been undertaken at IHU by Dr Abazari, who in 2013 published a paper detailing the preparation and investigation of the phase behaviour of formulations containing sevoflurane, medetomidine hydrochloride and ketamine hydrochloride in the presence of solvent and alternative propellants.[170] As a result of such study, the optimized drug formulations with the highest possible concentration of drugs exhibiting single-phase behaviour were determined. Dr Abazari highlighted the importance of developing aerosols with particulate size "*between 1 and 5 micrometers*" in order to facilitate absorption in the target respiratory tract.[171] His results indicated that "*the diameter of all the foreign particles coming out from the aerosol were smaller than 10 micrometer, and most of the particles, did range between 0.5 micrometres to 5 micrometres.*..[consequently]...*the particles can be absorbed in the upper respiratory tubes.*"[172] In the preface to the paper, Dr Abazari noted that "*aerosol anaesthetics have been considered in the performance of anaesthesia and motionlessness* [immobilisation]".[173] However, the specific intentions behind Dr Abazari's research and their proposed applications have not been made clear.

The three publicly available papers relating to fentanyl analogues and medetomidine aerosolisation discussed above were published in the *Journal of Passive Defence Science and Technology* (JPDST) which is also called the *Journal of Advanced Defence Science and Technology.*[174] The editor-in-chief of this publication is Dr Hossein Fakhraiain (who also co-authored the 2010 paper) and the address given for correspondence is the Bagheroloum Building of Imam Hossein University.[175] JPDST is a Persian language journal, and details in English of this multi-disciplinary publication are scarce. However, a review of the English language abstracts of the papers published in this journal show that a number described research with potential defensive military or security applicability.[176]

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170 Abazari, M.S., Investigating the Phase Behavior of Medetomidine Hydrochloride, Ketamine Hydrochloride and Sevoflurane in the Presence of Ethanol and Propellant, *Journal of Passive Defence Science & Techology*, 2013, issue 1, pp. 65-70. The paper is in Farsi; the extracts cited are from an unofficial English translation.

171 Abazari, M.S., (2013) *op.cit.*

172 Abazari, M.S., (2013) *op.cit.*

173 Abazari, M.S., (2013) *op.cit.*

174 SID, Scientific Information Database, http://www.sid.ir/en/JournalList.asp?ID=13253&Name=JOURNAL+OF+PASSIVE+DEFENCE+SCIENCE+AND+TECHNOLOGY (accessed 19th June 2014).

175 SID, Scientific Information Database, http://www.sid.ir/en/JournalList.asp?ID=13253&Name=JOURNAL+OF+PASSIVE+DEFENCE+SCIENCE+AND+TECHNOLOGY (accessed 19th June 2014).

176 To date fifteen issues, covering 2010 to 2013, of the *Journal of Passive Defence Science and Technology* are available from the SID website. Abstracts of papers are in English and Farsi with full papers available in Farsi only.

Although the intentions behind the research conducted into fentanyl and medetomidine at Imam Hossein University and the potential uses to which the findings may be applied, remain unclear, legitimate questions can be raised given the nature of this academic institution. Imam Hossein University (IHU) was established in 1986 by Mohsen Reza'i, then Commander of the Sepāh e Pāsdārān (Army of Guardians), also known as the Iranian Revolutionary Guards (IRG).[177] The university is reportedly run on military lines and is used for training of IRG personnel;[178] the current university chancellor is a Brigadier General of the IRG.[179]

On 15th July 2014, in correspondence to BNLWRP, regarding the work of Dr Fakhraian and colleagues at IHU, the Secretary of the Iranian CWC National Authority, Dr Farajvand, stated that *"Dr. Fakhrian is interested in advance [of] academic and scientific chemical issues that [are] not prohibited by the Chemical Weapons Convention"*[180] The publication of this research in *"international journals and [at] conferences stems from the fact that [such research] is carried out for solely scientific purposes"* Furthermore, this *"academic research is financed by [the] ministry of science and technology."* Dr Farajvand also noted that *"IHU has held several training courses for its students and researchers to [make them] aware...with regard to the provisions of the CWC."*[181]

In addition, Dr Farajvand enunciated Iran's position with regard to ICAs and their regulation under the Convention:

> *"The Islamic Republic of Iran strongly believes that deploying and using any kind of chemical substances, RCA or ICA, as [a] matter of warfare is against the letter and spirit of the CWC. We also support any effort in the OPCW to clarify the issue and to list them in the toxic chemical schedules."* [182]

This statement builds upon previous Iranian declarations on this issue. In November 2007, in a meeting of the Open Ended Working Group preparing for the 2nd CWC Review Conference, Iran

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177 Nuclear Threat Initiative, Imam Hossein University (IHU), http://www.nti.org/facilities/251/ (accessed 9th May 2014). For more information see the University website http://www.ihu.ac.ir/?q=fa/node/1 (accessed 9th May 2014).

178 Nuclear Threat Initiative, Imam Hossein University (IHU), http://www.nti.org/facilities/251/ (accessed 9th May 2014).

179 See for example: Commander: Enemies Trying to Downplay Persian Gulf's Importance, *FARS News Agency*, 2012. Available at http://www.highbeam.com (accessed 20th August 2014); Zarifmanesh: Universities are front line in fight against 'Global Arrogance', *Sepah News*, 30th January 2013, as cited in: Lucas, S. and Paraszczuk, P. The Resistance Economy, in: *L'économie réelle de l'Iran: Au-delà des chiffres*, (Ed.) Makinsky, M., Editions L'Harmattan, Paris, 2014, also cited in: *Iran Military News*, http://iranmilitarynews.org/tag/ brigadier-general/ (accessed 9th May 2014).

180 Correspondence to Dr M. Crowley, BNLWRP, from Dr H. Farajvand, Secretary of the National Authority for the CWC, Ministry of Foreign Affairs of the Islamic Republic of Iran, 15th July 2014.

181 National Authority for the CWC (15th July 2014) *op.cit.*

182 National Authority for the CWC (15th July 2014) *op.cit.*

called on States Parties to discuss the issue of ICAs.[183] Furthermore, as a member of the Non-Aligned Movement (NAM), Iran would presumably have endorsed the *"Proposal by the NAM CWC States Parties and China on the Draft Report of the Second Review Conference"*, distributed in April 2008, which recommended that the Conference *"categorically condemn[ed] the use of chemical weapons including incapacitating agents or riot control agents as a method of warfare by any state, group or individual under any circumstances."*[184]

To date, Iran has made no declaration to the OPCW clarifying whether it considers the development, acquisition, stockpiling or use of ICA weapons for law enforcement purposes to be permissible under the CWC and relevant international law. However, in further correspondence with BNLWRP, Dr Farajvand stated:

> *"Iranian law enforcement [personnel] do not have or use these [chemical] agents … We believe that any use of these chemicals in any conflict falls under the definition of the Chemical Weapons Convention that prohibit[s] the use of any chemicals, including RCAs and ICAs, as a matter of warfare. To prohibit ICAs for law enforcement we move in line with the wish of the States Parties to the CWC. The outcome of the discussions in the Hague with regards to prohibition of ICAs will receive a positive response from our side."*[185]

It would be beneficial if Iran made a formal public statement to the OPCW, for example at the forthcoming 19th CSP, annunciating its position on these matters.

4.2.5. ISRAEL

Analysis of publicly available information indicates that Israel initiated a chemical weapons programme in the mid-1950s, which according to Knip and Cohen, may have included work by the Israel Institute of Biological Research (IIBR) on chemical and toxin incapacitating agents.[186] Papers

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183 The Iranian intervention was recorded in the OEWG Chair's report thus: *"In discussing the GPC [General Purpose Criterion], it was important to consider Article I Paragraph 1(a) of the Convention, and to address riot-control agents and their use beyond State Party jurisdictions. In this respect it was important to understand that the use of riot-control agents in situations of conflict could be considered as a method of warfare.* ***Iran also stated that the use of incapacitating agents should be an issue discussed by States Parties in this context."*** [Emphasis added]. OEWG-XIII, Thirteenth Meeting of the Open-Ended Working Group for the Second Review Conference (Ieper Room, 15 November 2007), Informal Record of the Chairperson, at paragraph 15, as cited in: Perry Robinson, J. Disabling Chemical Weapons, A Documented Chronology of Events, 1945-2011, Harvard Sussex Program.

184 *Note by the delegation of the Republic of Cuba addressed to the Chairperson of the Second Special Session of the Conference of the States Parties to review the operation of the Chemical Weapons Convention* (Second Review Conference), The Hague, Netherlands, RC-2/CRP.2, 8 April 2008, paragraph 2.bis.

185 Correspondence to Dr M. Crowley, BNLWRP, from Dr H. Farajvand, Secretary of the National Authority for the CWC, Ministry of Foreign Affairs of the Islamic Republic of Iran, 26th July 2014.

186 Knip, K. Biologie in Ness Ziona, NRC Handelsband, 27th February 1999 available at: http://retro.nrc.nl/W2/Lab/Ziona/inhoud.html (accessed 19th June 2014). Knip's research report is in Dutch. A brief overview of his findings is contained in Cohen, A. Israel and chemical/biological weapons: history, deterrence, and arms control, *The Nonproliferation Review*, Fall-Winter 2001, pp.38-39.

published by scientists working at IIBR during the 1960s till the end of the 1980s indicate research into a range of potential ICAs[187] and/or related receptor sites[188].

In its 2005 analysis of Israel's biological and chemical programs, the Swedish Defence Research Institute concluded that*: "The state previously developed offensive biological and chemical warfare capabilities. It has not been possible to conclude if these offensive programs still remain active today."*[189] The report contended that:

> *"...Israel has the scientific know-how and the industrial infrastructure to de novo produce and deploy militarily significant CBW rapidly if so desired...In our view, the focus of the Israeli chemical and biological capacity today is to develop agents for small-scale covert use, i.e. a so-called "dirty tricks" program."*[190]

There has, to date, been one widely reported use of an incapacitating chemical agent by the Israeli security services (Mossad) in October 1997, in either a failed assassination attempt or a kidnapping operation that subsequently went awry.[191] According to a January 1998, *Janes Intelligence Review* article: the chemical agent used was *"believed to have been a synthetic opiate called Fentanyl which, absorbed through the skin and quickly metabolised, can kill within 48 hours and leaves no trace."*[192] The Israeli intelligence team that conducted the operation reportedly included one physician, who *"also carried an antidote known as Narcan or Naloxone in case something went*

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187 See for example: Kalir. A., Edery, H., Pelah, Z, Balderman, D. and Porath, G., 1-Phenylcycloaklamine Derivatives. II. Synthesis and Pharmacological Activity. *Journal of Medical Chemistry*, volume 12, issue 3, May 1969; Torten, M., Miller, C., Eisele, J., Henderson, G. and Benjamin, E.. Prevention of the effects of fentanyl by immunological means, *Nature*, volume 253, issue, February 1975, pp.565-566; Simon, G.. Chari-Bitron, A. and Motola, L. Localization of Phenylcyclidine in the rat brain *in vivo*, Toxicology in the use, misuse, and abuse of food, drugs and chemicals, *Archives of toxicology*, volume 6, 1983, pp.122-127; Eisele, J. Reitan, J., Torten, M. and Miller C. Myocardia sparing effect of fentanyl during halothane anaesthesia in dogs, *British Journal of Anaesthesia*, volume 47, 1975, pp.937-940.

188 Gabrielevitz, A.,Kloog, Y., Kalir, A., Balderman, D.,and Sokolovsky, M. Interaction of phencyclidine and its new adamantyl derivatives with muscarinic receptors, Life Sciences, volume 26, issue 2, 14th January 1980, pp. 89–95; Amitai, G., Avissar, S., Balderman, D., and Sokolovsky, M. Affinity labeling of muscarinic receptors in rat cerebral cortex with a photolabile antagonist, *Proceedings of the National Academy of Sciences of the United States of America*, volume 79, issue 2, January 1982, pp.243–247.

189 Normack, M., Lindblad, A., Norqvist, A., Sandstrom B.,& Waldenstrom. L. *Israel and WMD: Incentives and capabilities*, Swedish Defence Research Agency (FOI), December 2005, http://www.foi.se/ReportFiles/foir_1734.pdf (accessed 11th August 2014), p.41.

190 Normack, M., Lindblad, A., Norqvist, A., Sandstrom B.,& Waldenstrom. L. (December 2005) op.cit., p.41.

191 See: Harvard Sussex Programme, News Chronology, *CBW Conventions Bulletin*, 38, December 1997, p.29; Physician Member of Hit Team, Paper Says, *Canadian Medical Association Journal*, volume. 157, number 11, December 1997, p. 1504; Beyer, L. Don't Try This at Home--Or in Aman, *Time*, volume 150, number 17, October 27, 1997, p. 27. – as cited in *The Moscow Theater Hostage Crisis: Incapacitants and Chemical Warfare*, Chemical and Biological Weapons Nonproliferation Program, CNS, James Martin Center for Nonproliferation Studies, Monterrey Institute of International Studies, http://cns.miis.edu/stories/02110b.htm#fn1 (accessed 16th April 2014)];'Should there be a need': The inside story of Israel's chemical and biological arsenal, *Times of Israel*, Ginsburg , M. 17th September 2013, http://www.timesofisrael.com/israels-chemical-arsenal-in-the-spotlight/ (accessed 16th April 2014). The Daring Attack That Blew Up in Israel's Face, Cowell, A. *New York Times*,15th October 1997 http://www.nytimes.com/1997/10/15/world/the-daring-attack-that-blew-up-in-israel-s-face.html?pagewanted=all&src=pm (accessed 16th April 2014).

192 Israeli Intelligence Agenices Come Under Fire, *Janes Intelligence Review*, 1st January 1998.

wrong." [193] The target was Mr Khalid Mishal, a then-mid-ranking Hamas leader living in Jordan. The Israeli group reportedly followed Mr Mishal and attempted to deliver the fentanyl trans-dermally. Mr Mishal's driver who witnessed the event, described the attack to the *New York Times*: *"a man advanced toward Mr. Meshal and then lunged toward the area around his left ear. The Mossad agent's hand… was wrapped in a white bandage, with a small lead-colored protuberance in the palm."*[194] The paper also interviewed Mr Mishal who stated: *"I felt a loud noise in my ear…It was like a boom, like an electric shock. Then I had [a] shivering sensation in my body like an electric shock."*[195] Mr Mishal was able to escape the attack, but following the event, was reportedly seriously affected by the drug, and required significant medical attention. King Hussein of Jordan reportedly demanded that Israel provide an antidote. Mr Mishal subsequently made a full recovery.[196] On 5th October 1997, the Israeli Government publicly admitted responsibility for the attack, and on 7th October initiated an inquiry into the incident.[197]

It appears that the October 1997 operation may not have been an isolated event. *Janes Intelligence Review* stated that *"Israeli officials"* interviewed by *Janes "indicated that Mossad has used Fentanyl in other operations, which they declined to describe, noting that it had a "100 per cent success rate"."*[198] Similarly, in a *Time* magazine article, Israeli *"government officials"* reportedly stated that *"the chosen method of assassination had been, until now, 'foolproof'"* and that *"the decision to act was taken based on the 100% success rate of this method, which left no fingerprints whatsoever. If they had done it the right way, no one would have noticed."*[199] There have been no subsequent reports of use by the Israeli security or military forces of weapons employing fentanyl or other ICAs.

There is insufficient publicly available information to determine whether any Israeli entity is currently undertaking research into weapons employing ICAs, or whether Israel holds stockpiles of such weapons. Israel has made no clarificatory statement on this issue. There is limited information available indicating that the IIBR may be conducting work in potentially relevant dual-use fields, although the details of the specific IIBR research projects are not available.

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193 Janes Intelligence Review (1st January 1998) *op.cit.*
194 Cowell, A. *New York Times*, (15th October 1997) *op.cit.*
195 Cowell, A. *New York Times*, (15th October 1997) *op.cit.*
196 Harvard Sussex Programme CBW Conventions Bulletin (December 1997) *op.cit.*, p.29.
197 Amnesty International, *Attempt to kill Hamas leader follows a pattern of extrajudicial killings*, News Service 168/97, 8th October 1997, AI Index: MDE 15/89/97; Harvard Sussex Programme CBW Conventions Bulletin (December 1997) *op.cit.*,p.29.
198 Janes Intelligence Review (1st January 1998) *op.cit.*
199 Beyer, L. Hamad, J., and Klein, A. What went wrong?; the botched hit on a Hamas leader in Jordan is the latest big problem for Israel's Benjamin Netanyahu, *Time magazine*, 27th October 1997, p.52: As cited in: Normack, M., Lindblad, A., Norqvist, A., Sandstrom B.,& Waldenstrom. L (December 2005) *op.cit.*

Currently the IIBR has *"approximately 370 employees, 160 of whom are scientists holding doctorates in biology, biochemistry, biotechnology, analytic, organic and physical chemistry, pharmacology, mathematics, physics and environmental sciences."*[200] In addition, the IIBR employs *"170 certified technicians, representing a broad spectrum of capabilities."*[201] The IIBR operates *"under the jurisdiction of the Israel Prime Minister's Office and works in close cooperation with a host of government agencies including…the Ministry of Defense."*[202] Whilst the IIBR clearly conducts research and publishes papers relating to chemical and biological weapons defence, much of its work is classified, giving rise to speculation about its nature and purpose.

According to its website, the IIBR *specializ[es] in the fields of biology, medicinal chemistry and environmental sciences."*[203] Amongst the activities listed under its *"medicinal chemistry"* specialism are: *"Design and synthesis of biologically active molecules"*[204]; *"Pharmacokinetic studies and investigation of drug delivery systems;* and *"Drug-receptor interactions and physiological responses mediated by distinct neurotransmitter receptor sub-types."*[205]

Israel signed the Chemical Weapons Convention in 1997, but has not yet ratified the Convention. As a signatory State it has therefore rendered political support to the objectives and principles of the CWC and has committed itself to not undermining the Convention's objectives. The use of any toxic chemical as a weapon in armed conflict is absolutely prohibited under the Chemical Weapons Convention as well as customary international humanitarian law. To date, however, Israel has made no formal statement recognising that the use of ICA weapons in such circumstances is prohibited under the CWC. Similarly, Israel has not clarified its position on whether and if so, under what circumstances, it considers the use of ICA weapons to be permissible for law enforcement under the CWC and relevant international law. It would be beneficial if Israel, as a signatory State, made a formal statement to the OPCW, for example at the forthcoming 19th CSP, clarifying its position on these matters.

200 Israel Institute for Biological Research, http://iibr.gov.il/Default.aspx (accessed 11th August 2014).
201 Israel Institute for Biological Research, http://iibr.gov.il/Default.aspx (accessed 11th August 2014).
202 Israel Institute for Biological Research, http://iibr.gov.il/Default.aspx (accessed 11th August 2014).
203 Israel Institute for Biological Research, http://iibr.gov.il/Default.aspx (accessed 19th June 2014).
204 Israel Institute for Biological Research, http://iibr.gov.il/Medicinal-Chemistry/Design-and-Synthesis.aspx (accessed 19th June 2014).
205 Israel Institute for Biological Research, http://iibr.gov.il/Medicinal-Chemistry/Pharmacology-and-Toxicology.aspx (accessed 19th June 2014).

4.2.6. RUSSIAN FEDERATION

There are indications that the Soviet Union and subsequently the Russian Federation conducted research into ICA weapons prior to and following the coming into force of the CWC. According to Perry Robinson, a 1964 U.S. analysis of Future Trends in Soviet Military Programs contained in the Joint Strategic Objectives Plan for FY 1970-1974 stated that:

> *"Soviet [CW] research and development program continues to be active on a scale generally comparable with that in the U.S. Current efforts are focused on developing new toxic agents and munitions for their delivery…Many studies potentially applicable to discovery and development of nonlethal incapacitating agents are in process, and a new agent of this type could appear at any time."*[206]

Furthermore, Perry Robinson has noted a report stating that*:*

> *"In the Soviet Union…the Central Committee and the Council of Ministers adopted a resolution in May 1971 on the building of production capacity for "non-lethal" chemicals resulting from the Foliant programme."*[207]

According to Riches, Read, Black, Cooper and Timperley: *"Russian military research on fentanyls occurred before 1994"*.[208] In support of their assertion, the authors cited the following extract from a publication by General Antonov, a former director of the Military Chemical Institute in Shikhany:

> *"the action of analgesics is a knock-out blow—personnel subject to an attack of forces only a few minutes after the beginning of a chemical attack will lose their capacity to stand, not to mention move about. In severe cases people will enter an 'unconscious state' and 'carfentanil is one of the most active substances of the entire group of the studied derivatives of fentanyl. It manifests its activity for different pathways of entry into the organism, including inhalation of vapours or aerosol.'"*[209]

During the early 1980s there were reports, based upon eye witness testimony, that the Soviet Union had employed a wide variety of chemical agents, including ICA weapons, in Afghanistan against

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206 JSOP-70 is reproduced as Document 43 in U.S. Department of State, *Foreign Relations of the United States*, Johnson Administration (1964-1968), volume X, National Security Policy (Washington, DC: U.S.GPO, 2001). As cited in Perry Robinson, J. *Disabling Chemical Weapons A Documented Chronology of Events, 1945-2011*, 20th November 2012 copy [provided by author].

207 Perry Robinson, J. "Incapacitating chemical agents" in context: an historical overview of states policy in: *"Incapacitating chemical agents" Law enforcement, human rights law and policy perspectives*, Montreux, Switzerland, 24th – 26th April 2012, p.92. For original source citation see: Perry Robinson, J. (20th November 2012*) op.cit.*, entry 710519.

208 Riches, J. R.; Read, R. W.; Black, R. M.; Cooper, N. J.; Timperley, C. M., Analysis of clothing and urine from Moscow theatre siege casualties reveals carfentanil and remifentanil use, *Journal of analytical toxicology*, 11/2012, Volume 36, Issue 9

209 Antonov, N.S. (1994) *Chemical weapons at the turn of the century* English Translation LN72-96. Progress Publisher, Moscow: as cited in Riches, R. *et al* (2012) *op.cit.*

armed opposition groups. Although the U.S. investigated these reports, no sample analysis of the putative agents was obtained and the reports were never confirmed.[210]

Information indicating continued Russian efforts to study or develop ICA weapons following the coming into force of the CWC, came to light after a presumed derivative of fentanyl was employed by Russian security forces to free 900 hostages held by heavily armed Chechen separatists in the Dubrovka theatre in Moscow, in October 2002.[211] The Russian security forces pumped the aerosolised ICA into the theatre, putting the hostages and some of the hostage-takers into a 'deep sleep'. Approximately 30 minutes later, members of the Russian *Spetsnaz* special forces[212] stormed the theatre and killed all of the hostage-takers, including those unconscious from the ICA. According to an October 2003 statement by the press department of the Moscow city Prosecutor's Office, 125 hostages died from the effects of the ICA, some of them while in hospital, while an additional five were reportedly killed by the hostage-takers.[213] In addition, it has been reported that an undetermined, but large, additional number of hostages suffered long-term damage, or died prematurely in the years after the siege.[214]

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210 See: Michael Getler, *Washington Post*, 29th March 1980, p 6, "*Allies urged to face grim Afghanistan realities*"; *Official Text*, International Communication Agency, US Embassy, London, 8th April 1980; U.S. State Department on 7 August 1980, *Reports of the Use of Chemical Weapons in Afghanistan, Laos and Kampuchea, 7th August 1980; U.S., Director of Central Intelligence, National Intelligence Daily, 31st July 1980;* U.S., Director Central Intelligence, Special National Intelligence Estimate, *Use of Toxins and Other Lethal Chemicals in Southeast Asia and Afghanistan*, SNIE 11/50/37-82, 2 February 1982, Volume I – Key Judgements, pp 3-4: all cited in Perry Robinson, J. (20th November 2012) *op.cit.*, entry 800328].

211 For descriptions of the incident see, e.g., Amnesty International, *Amnesty International 2003 Annual Report*, London, 2003, entry for the Russian Federation, p. 208; Amnesty International, *Rough Justice: The law and human rights in the Russian Federation*, AI Index EUR 46/054/2003, October 2003; Koplow, D. 'The Russians and the Chechens in Moscow in 2002', in *Non-lethal weapons: The Law and Policy of Revolutionary Technologies for the Military and Law Enforcement*, Cambridge University Press, 10th April 2006; Pearson, A., Chevrier, M. and Wheelis, M. (eds),(2007) *op. cit.*; Human Rights Watch, *'Independent Commission of Inquiry Must Investigate Raid on Moscow Theater: Inadequate Protection for Consequences of Gas Violates Obligation to Protect Life'*, Press release, 30th October 2002; see also BBC news coverage, in particular: 'How Special Forces Ended Siege', 29th October 2002, and BBC 2, *Horizon: The Moscow Theatre Siege* (broadcast 15 January 2004),

212 The *Spetsnaz* 'Alpha Team' that conducted the assault was a hybrid commando unit of the Federal Security Service (FSB), according to BBC News, 'Spetsnaz: Russia's Elite Force', 28 October 2002. This 1,500-2,000-strong anti-terrorist unit had seen extensive action in Afghanistan and Chechnya. As cited in Koplow, D. (2006) *op. cit.*

213 Dunlop, J.B. The 2002 Dubrokvka and 2004 Beslan hostage crises, a critique of Russian counter-terrorism, *Soviet and Post-Soviet politics and society*, Verlad, Stuttgart, 2006, pp. 145–6.

214 Wheelis, M. 'Human impact of incapacitating chemical agents' in: ICRC, *Expert Meeting: Incapacitating chemical agents, implications for international law*, Montreux, Switzerland, 24–26 March 2010, October 2010; Levin, D. and Selivanov, V. Medical and Biological Issues of NLW Development and Application, *Proceedings of the Fifth European Symposium on Non-Lethal Weapons*, 11th –13th May 2009, Ettlingen, Germany, European Working Group on Non-Lethal Weapons, V23, p. 7. See also Wheelis, M. Nonconsensual Manipulation of Human Physiology Using Biochemicals, in Pearson, A., Chevrier, M. and Wheelis, M. (eds), (2007) *op. cit.*, p. 6. According to Levin and Selivanov, "Part of the rescued hostages have received functional damages of health, which have been revealed after a while (about half a year) after operation, even at timely application of an antidote." Levin, D. and Selivanov, V. '(2009) *op. cit.*, p. 7. Almost all of a sample of 100 former hostages contacted by CBS News reported "*having significant medical problems since the attack – problems they blame on the gas*". CBS News also reported that: "*Some physicians who treated the survivors*

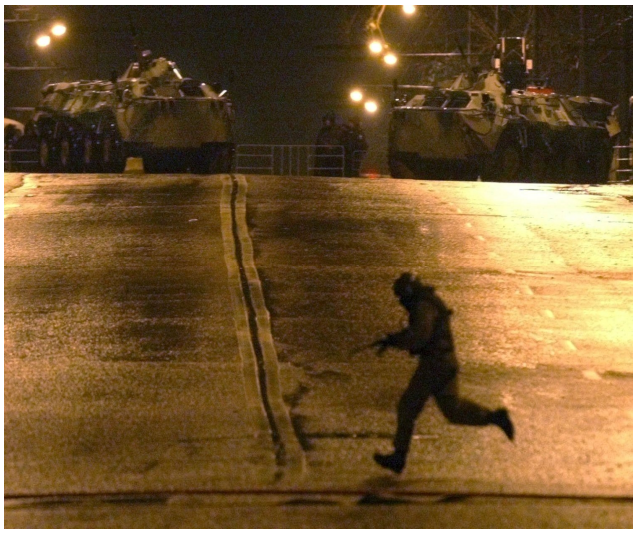

Figure 8: Images following the use of an ICA weapon on 26th October 2002 by Russian security forces in an attempt to free 900 hostages held by armed Chechen fighters in the Dubrovka theatre in Moscow. (Left) A special forces soldier runs across the road during the storming of the theatre. EPA Photo / Sergei Chirikov. (Right) The body of a hostage on a stetcher at Moscow's hospital 13, where many hostages were subsequently treated. EPA Photo / Yuri Kadobnov.

Treatment of the hostages who had been poisoned was delayed and compromised by the refusal of the Russian authorities to state publicly what type of ICA had been used in the theatre for four days after the siege had ended.[215] On 30th October 2002 the Russian Health Minister, Yuri Shevchenko, identified the incapacitating agent as *"a mixture of derivative substances of the fast action opiate Fentanyl."*[216] Mr Shevchenko further stated that: *"I officially declare: chemical substances which might have fallen under the jurisdiction of the international convention on banning chemical weapons were not used during the special operation."*[217] However, the Minister refused to be more

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think the gas has long-term consequences – but they're afraid to speak out because Moscow medical authorities ordered city doctors to play down the effect of the gas." 'Four Years Later, Moscow Hostages Suffering', *CBS Evening News*, 21st October 2006, www.cbsnews.com/stories/2006/10/21/eveningnews/main2112859.shtml, (accessed on 30 July 2009).

215 See for example: Human Rights Watch, press release*: Independent Commission of Inquiry Must Investigate Raid on Moscow Theater: Inadequate Protection for Consequences of Gas Violates Obligation to Protect Life*, 30th October 2002, Human Rights Watch.

216 ITAR-TASS, from Moscow in English, 2112 hrs GMT 30th October 2002, as in FBIS-SOV-2002-1030, 'Russian experts discuss use of Fentanyl in hostage crisis', as cited by Perry Robinson, J (2012) *op.cit,* Reference 021026

217 Alison, S. [from Moscow for Reuters], 1257 hrs ET 30th October 2002, 'Russian confirms siege gas based on opiate fentanyl', as cited in Perry Robinson, J. (2012) *op.cit.* Reference 021026**.**

precise about the chemicals used even on 11th December 2002 when faced with a parliamentary question. He said it was a *"State secret."*[218]

In December 2011, the European Court of Human Rights issued its judgement following a formal complaint against the Russian Federation by 64 survivors or relatives of those who lost their lives in the siege.[219] The Judgement documented Russian Government statements that the ICA was a *"special mixture based on derivatives of phentanyl* [sic]" [220] and was a *"composite chemical compound of a general narcotic action"*. [221] However, the Court recorded that it was not supplied with *"the exact formula of the gas"* [222] and noted that *"Even at the domestic level that formula was not revealed by the security forces to the courts and to the investigative authorities."* [223]

In 2012, a paper by Riches *et al* detailed the results of trace analysis undertaken by researchers from the U.K.'s Defence Science and Technology Laboratory (DSTL) at Porton Down of extracts of clothing and urine from survivors of the Moscow theatre siege. The paper indicated that the ICA weapon comprised a mixture of two anaesthetics, carfentanil and remifentanil.[224] At the time of writing, the Russian authorities have not publicly responded to this paper.

There has been one further reported (though to date unconfirmed) possible use of an ICA weapon by Russian security forces against armed Chechen separatists in Nalchik on 13th October 2005. Russian NTV reported that on the second day of fighting Russian forces employed a "knockout gas" against the armed separatists who had taken two women hostage.[225] Doctors later stated that the hostages were suffering from the effects of an unspecified 'non-lethal' gas.[226] It was also

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218 Amnesty International (October 2003) *op.cit.*, p.53.

219 European Court of Human Rights (ECtHR), *Finogenov and others v. Russia*, Judgment (App. Nos. 18299/03 and 27311/03), 20 December 2011.

220 European Court of Human Rights, *Finogenov and others v. Russia*, Judgment *op.cit* (December 2011), paragraph 101.

221 European Court of Human Rights, *Finogenov and others v. Russia*, Judgment *op.cit* (December 2011), paragraph 28.

222 European Court of Human Rights, *Finogenov and others v. Russia*, Judgment *op.cit* (December 2011), paragraph 200.

223 European Court of Human Rights, *Finogenov and others v. Russia*, Judgment *op.cit* (December 2011), paragraph 200.

224 Riches, J., Read, R., Black, R., Cooper, N. and Timperley, C., Analysis of Clothing and Urine from Moscow Theatre Siege Casualties Reveals Carfentanil and Remifentanil Use, *Journal of Analytical Toxicology*, volume 36, 2012, pp.647-656.

225 Troops crush Chechen 'bandits' as Putin promises no mercy, *The Independent*, 15th October 2005, http://www.independent.co.uk/news/world/europe/troops-crush-chechen-bandits-as-putin-promises-no-mercy-510981.html, (accessed 30th July 2009); Russian troops root out militants after days of fighting leave 100 dead, *The Guardian*, 15th October 2005, http://www.guardian.co.uk/world/2005/oct/15/ russia.nickpatonwalsh, (accessed 30th July 2009).

226 Von Twickel, N. Unmasking Dubruvka's Mysterious Gas, *The Moscow Times*, 23rd October 2007, www.fco.cat/files/imatges/Butlleti%20111/Moscow%20Times.pdf (accessed 30th July 2009).

reported that victims of the attack were administered an antidote.[227] However, a Russian Government spokesperson later questioned about this incident, stated that *"he had never heard allegations that a chemical agent was used in Nalchik."*[228]

There are indications that following the Moscow theatre incident, Russian researchers have continued work related to the future employment of ICA weapons. In 2003, a paper by Klochikhin, Pirumov, Putilov and Selivanov, attempting to forecast future European 'non-lethal' weapon application was presented at the 2nd Ettlingen Symposium on Non-Lethal Weapons. In it, the authors stated: *"Some experience of gas application in dramatic conditions of terrorists attack was gained in Moscow in 2002….The main problem is how to assess an impact of chemicals on a big crowd of civilians and terrorists between them in a concrete scenario and real conditions of application."*[229] The authors noted that whilst *"There has been significant success in the chemistry of calmatives…restriction of individual dosage is very important. There is still no perfect tranquillizing agent, but the problem of safety can be solved by the succeeding or simultaneous application of calmative and antidote. This can minimize potential fatality."*[230]

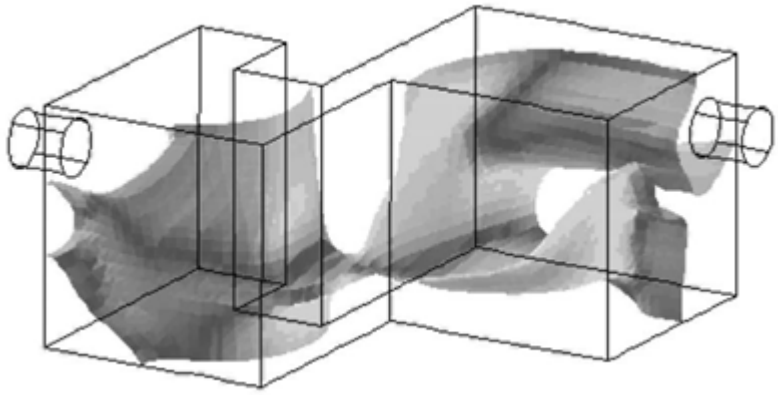

Figure 9: Image illustrating detailed numerical calculation of aerosol propagation through vents. Taken from *"Principles of Modelling of the Scenario of Calmative Application in a Building with Deterred Hostages"* by Klochikhin, Lushnikov, Zagaynov, Putilov, Selivanov and Zatekvakhin presented at the 3rd Ettlingen Symposium on Non-Lethal Weapons 10th - 12th May 2005.

A paper by Klochikhin, Lushnikov, Zagaynov, Putilov, Selivanov and Zatekvakhin presented at the 3rd Ettlingen Symposium on Non-Lethal Weapons in May 2005, described the computer modelling

227 Holley, D. Russian Forces Crush Rebels After Two Days of Fighting, *Los Angeles Times*, 15th October 2005, A3.

228 Von Twickel, N. (2007) *op.cit.*

229 Klochikhin, V., Pirumov, V., Putilov, A. and Selivanov, V. The Complex Forecast of Perspectives of NLW for European Application. *Proceedings of the 2nd European Symposium on Non-Lethal Weapons*, Ettlingen, Germany, 13-14th May 2003, V16, Pfinztal: Fraunhofer ICT, p.3.

230 *Ibid.*

of a scenario in which aerosolised chemical "calmative" agent was introduced into a building where hostages were held captive. The paper stated that: *"If the level of 95% efficiency is absolutely required to neutralize terrorists and to prevent mass destruction, there is no chance to eliminate hard consequences and fatalities. Calculations show that the majority of hostages can get serious poisoning and part of them – fatality. This is the cost of releasing if no other solutions [are] left."*[231] The authors reported that: *"One possible solution under discussion is to apply gaseous calmative agent and antidote together in the same composition or consequently after some delay. This is the way to control the value of impact and to decrease collateral damage."* [232]

The researchers noted that *"the real problem of chemical NLW is rather difficult. It requires serious efforts to develop reliable techniques and mathematic instruments for calculation of various scenarios…the full solution for such challenge demands the big intensive work of many scientific teams within several years."*[233]

It appears that Russian researchers have continued work to develop computer models for the application of what they describe as "calmatives" against groups of individuals in enclosed spaces. In November 2009, Klochikhin and Selivanov presented a *"Report on the 1st phase of the Project "Gas Flow"* to a meeting in London.[234] In the presentation, the authors described their work to develop computer code to generate 3-D simulations of *"an effective scenario of calmative application"* utilising existing medical data on "*calmatives*" and physical data describing the nature of "*gas"* movement in enclosed spaces. The authors stated that the resultant computer code: *"draws the gas; simulates gas transfer with air between rooms; calculates its concentrations in rooms; evaluates the calmative effects; shows the realistic simulation to define characters' status and gas concentration field to optimize the scenario gas effects".*[235] No further information about *Project "Gas Flow"* is currently in the public domain.

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231 Klochikhin, V., Lushnikov, A., Zagaynov, V., Putilov, A., Selivanov, V. and Zatekvakhin, M. Principles of Modelling of the Scenario of Calmative Application in a Building with Deterred Hostages, *Proceedings of the 3rd European Symposium on Non-Lethal Weapons*, Ettlingen, Germany, 10-12th May 2005, V17, Pfinztal: Fraunhofer ICT, p.3.

232 Klochikhin, V., Lushnikov, A., Zagaynov, V., Putilov, A., Selivanov, V. and Zatekvakhin, M. Principles of Modelling of the Scenario of Calmative Application in a Building with Deterred Hostages, *Proceedings of the 3rd European Symposium on Non-Lethal Weapons*, Ettlingen, Germany, 10-12th May 2005, V17, Pfinztal: Fraunhofer ICT, p.3.

233 Klochikhin, V., Lushnikov, A., Zagaynov, V., Putilov, A., Selivanov, V. and Zatekvakhin, M. (2005) *op.cit.*, pp.3-4.

234 Klochikhin, V. and Selivanov, V. *Report on the 1st phase of the Project "Gas Flow"*, Presentation in MBDA, 24th -27th November 2009, London. [Copy of presentation held by authors]. Further details of this London meeting are not available.

235 Klochikhin, V. and Selivanov, V. (2009) *op.cit.*, slide 77.

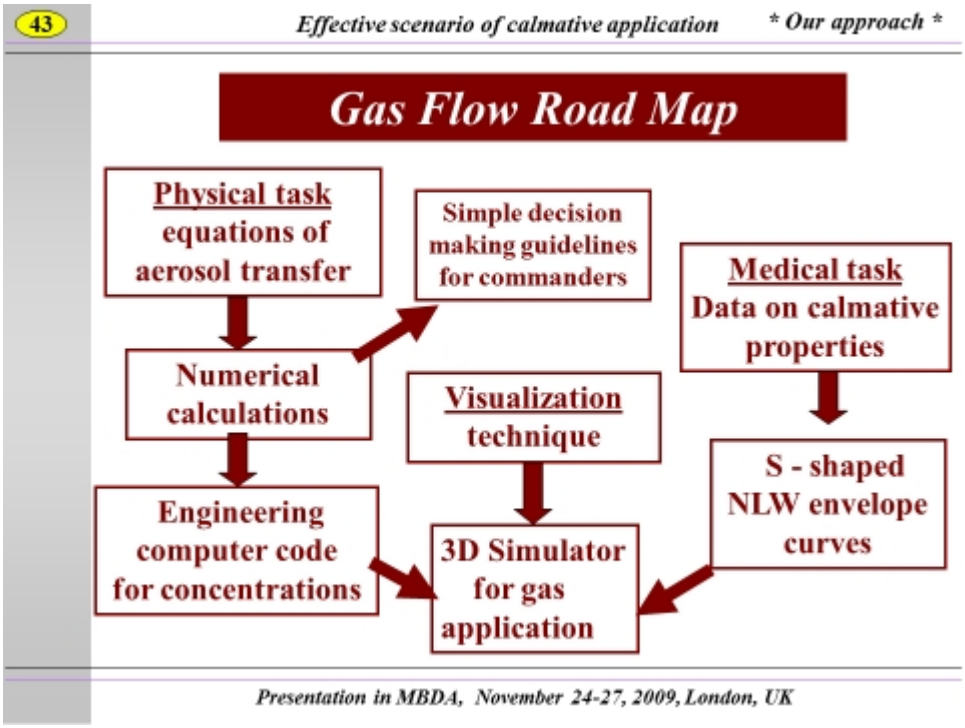

Figure 10: Image showing *"Gas flow road map"*. Taken from a presentation by Klochikhin and Selivanov entitled: *Report on the 1st phase of the Project "Gas Flow"*, given at a meeting held in London, 24th - 27th November 2009. Note that background images have been removed for greater clarity.

To date, no CWC State Party has formally raised concerns or provided information relating to contemporary ICA weapon research and development by the Russian Federation, at any public forum of the OPCW. However, the U.K. does appear to have raised this matter through other channels. According to a purported internal report for the U.S. State Department drafted by the U.S. delegation to the Australia Group and published by WikiLeaks, the U.K. delegation highlighted their concerns regarding possible Russian ICA weapons development, during the Information Exchange session of the 2006 Annual Plenary Meeting of the Australia Group.[236]

In addition, the 2012 paper by Riches, Read, Black, Cooper and Timperley, stated that: *"Scientific papers published by Russian military officers indicate an interest in fentanyls extending back 12*

236 According to the U.S. delegation's report, as published by Wikileaks, the U.K. statement came during discussion of Russia's expressed interest in joining the Australia Group. *"The UK commented on their concerns regarding Russian transparency about its CBW programs. The UK doubts the accuracy of the Russian CWC declaration, and efforts to clarify concerns have been unsuccessful. The UK assesses Russia maintains a CW program and makes agents that can defeat defensive measures that are not declared to the OPCW.* ***The UK was concerned about the possibility that incapacitants, like those used in the Dubrovka Theater, may be a part*** **[of]** ***the offensive CW program.*** [Emphasis added]. See: U.S. Paris Embassy, cable to the U.S. Secretary of State, sent on 20th June 2006, at 08.43 AM local time, marked SECRET, subject: Australia Group: 2006 Information Exchange (IE), available on WikiLeaks U.S. Embassy Cables, ref ID: 06Paris4218, http://wikileaks.org/cable/2006/06/06PARIS4218.html (accessed 17th June 2014), paragraph 42.

years: opioid receptor studies[237] [238]*, fentanyl analysis*[239] *and synthesis of fentanyl precursors."*[240] [241] Although this paper was not an official submission from the U.K. Government to the OPCW, the study on which it was based was funded by the U.K. Ministry of Defence (MoD) and conducted by research scientists working at the U.K. Defence Science and Technology Laboratory (DSTL). The paper was published with the permission of DSTL on behalf of the Controller of Her Majesty's Stationery Office.

The current authors have identified further papers by certain Russian life scientists cited in the U.K. DSTL study, indicating additional research relating to opiate receptors (OR) and their interaction with OR ligands.[242] [243] [244] [245] [246] [247] [248] [249]

To date the Russian Federation has provided no further details of the chemical or chemicals employed as an ICA weapon in the Moscow theatre siege, nor provided information as to whether stockpiles of weaponised ICAs are currently held in the Russian Federation. Furthermore, the Russian Federation has made no formal public statement clarifying whether research into the development and employment of weaponised ICAs is taking place, and if so, for what purposes.

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237 Kuzmina, N., Kuzmin, V., Development of concepts on the interaction of drugs with opioid receptors, *Russian Chemistry Reviews*, volume 80, 2011, pp.145-169.

238 Dukhovich, F., Darkhovskii, M., Gorbatova, E., Polyakov, V. The agonist paradox: Agonists and antagonists of acetylcholine receptors and opioid receptors. *Chemistry & Biodiversity* volume 2, 2005, pp.354-366.

239 Zlobin, V., Bukreeva, L., Kuznetsov, P., Panfilov, A., Nazarov, G., Kirsanov, A., Analysis of opiates by HPLC with indirect spectrophotometric detection, *Pharmaceutical Chemistry Journal* , volume 34, 2000, pp.279-280.

240 Panfilov, A., Markovich, Y., Ivashev, I., Zhirov, A., Eleev, A., Kurochkin,V., et al, Sodium borohydride in reductive amination reactions, *Pharmaceutical Chemistry Journal* , volume 34, 2000, pp.76-78.

241 Panfilov A., Markovich Y., Zhirov A., Ivashev, I., Kirsanov, A., Kondrat'ev,V. Reactions of sodium borohydride in acetic acid: Reductive amination of carbonyl compounds., *Pharmaceutical Chemistry Journal*, volume 34, 2000, pp.371-373.

242 Kuz'mina, N., Osipova, E., Kuz'min, V., and Sitnikov, V. Electron properties of aryl moieties in agonists and antagonists of opioid receptors, *Pharmaceutical Chemistry Journal*, volume 39, issue 12, December 2005, pp. 644-649.

243 Kuz'mina, N., Osipova, E., Kuz'min, V., Sitnikov, V. Effect of the tyramine fragment of opioid receptor ligands on their agonist and antagonist properties, *Pharmaceutical Chemistry Journal*, volume 40, issue 5, May 2006, pp.254-260.

244 Kuz'mina, N., Osipova, E., Kuz'min, V., and Sitnikov, V. Geometric parameters as a criterion for assessment of the bioactive conformations of opiate receptor ligands, *Russian Chemical Bulletin, International edtion,* volume 55, issue 9, September 2006, pp.1516-1522.

245 Kuz'mina, N., Osipova, E., Kuz'min, V., Sitnikov, V. A general model of the opiate pharmacophore 1. Regions of the opiate pharmacophore responsible for nonselective affinity for the opiate receptor, *Russian Chemical Bulletin, International edition,* volume 55, issue 9, September 2006, pp. 1523-1529.

246 Kuz'mina, N., Osipova, E., Kuz'min,V. and Sitnikov, V. General model of the opiate pharmacophore 2. Regions of the opiate pharmacophore defining agonistic properties of the opiate receptor ligands, *Russian Chemical Bulletin,* International edition, volume 57, issue 6, June 2008, pp.1277-1284.

247 Kuz'mina, N., Osipova, E., Kuz'min, V. and Sitnikov,V. General model of the opiate pharmacophore 3. Regions of the opiate pharmacophore determining antagonistic properties of the opiate receptor ligands, *Russian Chemical Bulletin, International edition,* volume 57, issue 6, June 2008, pp.1285-1298.

248 Kuzmina, N., and Stankov, I. Role of saturability of noncovalent interactions in the analysis of the three-dimensional structure—opioid activity relationship. *Russian Chemical Bulletin, International edition,* volume 61, issue 6, 2012, pp.1207-1214.

249 Kuzmina, N., Yashkir, V., Merkulov, V., Osipova, E. Method for estimating a compound's opiate activity based on a versatile three-dimensional model of nonselective opiate pharmacophore, *Russian Journal of Bioorganic Chemistry*, volume 38, issue 5, 2012, pp.507-519.

The use of any toxic chemical as a weapon in armed conflict is absolutely prohibited under the Chemical Weapons Convention as well as customary international humanitarian law. To date, however, the Russian Federation has made no formal statement recognising that the use of ICA weapons in such circumstances is prohibited under the CWC. Similarly, the Russian Federation has not clarified under what circumstances it considers the use of ICA weapons to be permissible for law enforcement under the CWC and relevant international law. It would be beneficial if the Russian Federation made a formal statement to the OPCW, for example at the forthcoming 19th CSP, clarifying its position on these matters.

4.2.7. SYRIA

Since the 1970s, Syria reportedly had acquired and/or developed and stockpiled quantities of a range of chemical weapons including blister agents and nerve agent precursors, as well as associated means of delivery.[250] On 23rd July 2012, the Syrian Ministry of Foreign Affairs stated that Syria possessed chemical weapons and that *"All of these types of weapons are in storage and under security and the direct supervision of the Syrian armed forces and will never be used unless Syria is exposed to external aggression".*[251]

Until recently there were no reports that this stockpile included weapons employing incapacitating chemical agents. However, from early 2012 there were repeated but, to date, unconfirmed allegations that the Syrian Government armed forces employed incapacitating chemical agents, during the ongoing conflict with armed opposition forces.[252]

On 21st February 2012, the Istanbul *Hürriyet Daily News* reported allegations by Lt Abdulselam Abdulrezzak, who the paper claimed *"used to work in the chemical weapons department in the Syrian army and defected to Turkey last week"*. It was claimed that: *"chemical weapons were used against civilians during the military offensive of the Syrian security forces in Bab Amr [a neighbourhood in Homs]"*. [253] Abdulrezzak reportedly stated that: *"BZ-CS, Chlorine Benzilate, which damages people's nerves and makes them fade away, is being used in Bab Amr."*[254] Perry Robinson noted that: *"this allegation seems to be the first occasion that incapacitating agent BZ*

250 See for example: *Country Profiles, Syria, Chemical*, Nuclear Threat Initiative, http://www.nti.org/country-profiles/syria/chemical/ (accessed 11th August 2014).

251 Associated Press, Syrian regime makes chemical warfare threat, *The Guardian*, 23rd July 2012; MacFarquhar, N. and Schmitt, E. Syria Threatens Chemical Attack on Foreign Force, *New York Times*, 23rd July 2012.

252 Both the Syrian Government armed forces and the armed opposition forces have been accused of utilising chemical weapons in Syria. To date the unconfirmed allegations of ICA weapons use appear to have been confined to the Syrian Government armed forces.

253 Ipek Yezdani, *Hürriyet Daily News*, 21 February 2012, "Chemical weapons used against Syrians, says defected soldier", as posted at www.hurriyetdailynews.com/PrintNews.aspx?PageID=383&NID=14223. As cited and discussed in: Perry Robinson, J. *Alleged Use of Chemical Weapons In Syria*, Harvard Sussex Program Occasional Paper No.4, 26th June 2013, pp.11-12.

254 *Ibid.*

has been mentioned [in the open literature] as an element of Syrian capability".[255] Perry Robinson further noted that *"it is not obvious why 'BZ-CS' should have been glossed as 'Chlorine Benzilate'. Nor is it obvious that either agent would have brought about the signs and symptoms described."* [256]

On 15th January 2013, *the Cable* (the on-line blog of the U.S. magazine *Foreign Policy*) carried an article by Josh Rogin that stated that the U.S. Consul-General in Istanbul, Scott Frederic Killner, had sent a secret cable to the State Department detailing his *"investigation into reports from inside Syria that chemical weapons had been used in the city of Homs on Dec 23".* [257] According to Rogin, an un-named *"Obama administration official who had reviewed the cable"* stated that *"We can't definitely say 100 percent, but Syrian contacts made a compelling case that Agent 15 was used in Homs on Dec 23."* [258] The un-named official also claimed that the investigation conducted by the consulate *"was one of the most comprehensive efforts that the U.S. government has made to investigate claims by internal Syrian sources. The investigation included a meeting between the consulate staff and Mustafa al-Sheikh, a high-level defector who was once a major general in Assad's army and key official in the Syrian military's WMD program."* [259]

Concerns about the veracity of the allegations contained in *"the Cable"* article soon emerged. On 15th January 2013, White House National Security Council spokesman Tommy Vietor stated that *"The reporting we have seen from media sources regarding alleged chemical weapons incidents in Syria has not been consistent with what we believe to be true about the Syrian chemical weapons program,"*[260] In addition, a number of chemical weapons experts questioned the article's reliability. Perry Robinson stated that: *"The ragbag symptomatology described, and especially the references to 'Agent 15'*[261]*, suggest that the reporting includes at least some misinformation, if not outright disinformation."*[262]

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255 Perry Robinson, J. (2013*) op.cit*., p.12.

256 Perry Robinson, J. (2013) *op.cit*. p.12.

257 Rogin, J. *Exclusive: secret State Department cable: chemical weapons used in Syria"* 15th January 2013 http://thecable.foreignpolicy.com/posts/2013/01/15/secret_state_department_cable_chemical_weapons_used_in_syria (accessed 11th August2014), p.1.

258 Rogin, J. (January 2013) *op.cit.*, p.2.

259 Rogin, J. (January 2013) *op.cit.*, p.1.

260 U.S. plays down media report that Syria used chemical weapons, Washington, Wed Jan 16, 2013, *Reuters*, http://www.reuters.com/article/2013/01/16/us-syria-usa-chemical-idUSBRE90F00P20130116 (accessed 11th August 2014).

261 In February 1998, the U.K. Secretary of Defence alleged that *"Iraq may have possessed large quantities of a chemical weapons agent known as Agent 15 since the 1980s*" See: *Hansard* (Commons), daily part, vol 306 no 115 cols 1-6, oral answers, 9 Feb 98, Mr George Robertson to Mr Winnick, as cited and discussed by Perry Robinson, J. (2013*) op.cit.*, pp.39-40. In September 1999, a report by the Defence Evaluation and Research Agency claimed Iraq *"possessed large quantities of a chemical warfare mental incapacitant"* called Agent 15 which was reported to be a glycolate. See: Biomedical Sciences Department, CBD Sector [of Defence Evaluation and Research Agency] Porton Down, *An Overview of Research carried out on Glycolates and Related Compounds at CBD Porton Down*, DERA/CBD/CR990418, September 1999, as cited and discussed

On 23rd April 2013, during a conference at the Institute for National Security Studies (INSS) in Tel Aviv, a senior Israeli military intelligence official – Brigadier Itai Brun, commander of the research division of the Israeli Defence Force (IDF) Intelligence Directorate - reportedly stated that *"Israel has information indicating that Assad's forces used a lethal chemical weapon several times against the rebels, likely sarin, along with incapacitating chemical agents"*.[263]

On 27th April 2013, the Dubai-based television news channel *Al Arabiyaairs* broadcast excerpts from an interview with a Syrian army defector, Brigadier Zaher Al-Saket, described as *"former head of chemical warfare in the 5th division"*, in which he stated:

> *"When the demonstrations started, the regime used harassing agents, like any country in the world using tear gas to disperse demonstrations. As for [other types of chemical weapon] ... the regime used incapacitating agents at first, but when the world remained silent about this, and the regime thought that the international community did not care, it used lethal weapons in more than 13 locations."*[264]

On 10th April 2014, *Janes Defence Weekly*, reported claims from an unnamed *"senior Israel source"* that pro-Government forces in Syria used a chemical agent that *"neutralises, but does not kill"* during fighting on 27th March 2014. The Israeli official stated that pro-Government forces used a rudimentary delivery mechanism, most-likely grenade-type canisters, to deploy the agent, which he did not identify.[265]

Save for the conflicting testimony of the victims of the reported chemical weapons attacks, no evidence has been placed in the public domain supporting the allegations of the development or use, by either the Syrian Government or the armed opposition, of weapons employing incapacitating chemical agents.

To date, there have been two reports by the United Nations Mission to Investigate Allegations of the Use of Chemical Weapons in the Syrian Arab Republic[266]. The first (interim) report was

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by Perry Robinson, J. (2013) *op.cit.*, pp.39-40. No substantiated evidence for the U.K. claims has to date been placed in the public domain.

262 Perry Robinson, J. (2013) *op.cit.*, p.15. See also: Jeffrey Lewis's highly critical analysis of these claims. [Jeffrey Lewis, 25 January 2013, *"Buzz bomb: Why everyone's wrong about Assad's zombie gas"*, www.foreignpolicy.com/articles/2013/01/25/buzz_bomb? (accessed 11th August 2014)]; Binnie, J. and Dewey, K. U.S. plays down Syrian chemical weapons reports *Janes Defence Weekly*, 16th January 2013.

263 Friedman, D. Chemical weapons in Syria: has a red line been crossed?, INSS Insight no 421, 29th April 2013. As cited by Perry Robinson, J. (2013) *op.cit.*, p.29.

264 Zaher Al-Saket, interview broadcast on Al-Arabiya TV on 27 April 2013, transcript as excerpted and translated in "Defecting Syrian Officer Brigadier-General Zaher Al-Saket: I was ordered to use chemical weapons", The Middle East Media Research Institute (MEMRI) clip no 3822, 27 April 2013, www.memritv/clip_transcript/en/3822.htm#via BWPP DF. As cited by Perry Robinson, J. (2013) *op.cit.*, pp.7-8.

265 Israeli official says Syria has used chemical incapacitant against insurgents, *Janes Defence Weekly*, 10th April 2014.

266 The United Nations Mission was established by the UN Secretary General based on his authority under

restricted to *"ascertain[ing] the facts"* related to *"the alleged use of chemical weapons in the Ghouta area of Damascus on 21st August 2013"*.[267] It concluded that *"on 21 August 2013, chemical weapons have been used in the ongoing conflict between parties in the Syrian Arab Republic, also against civilians, including children, on a relatively large scale.*[268] The report further concluded that *"the envirionmental, chemical and medical samples we have collected provide clear and convincing evidence that surface-to-surface rockets containing the nerve agent Sarin were used in Ein Tarma, Moadamiyah and Zamalka in the Ghouta ara of Damascas."*[269] The second (final) report,[270] in addition to documenting the Ghouta attacks, also stated that the UN Mission collected *"credible"* information corroborating allegations of the use of a chemical weapon – apparently an organophosphorous compound - against soldiers and civilians in Khan Al Asal on 19th March 2013. The report also described the Mission's investigations of other allegations of chemical weapons use in Jobar, Saraqueb, Ashrafiah Sahnaya, Bahhariyeh and Sheik Maqsood. Neither U.N. Mission report made any reference to the use of ICA weapons anywhere in Syria.

On 29th April 2014, the OPCW Director-General established a fact-finding mission (FFM) to examine alleged uses of chlorine gas as a weapon in Syria.[271] On 10th September in its second report the FFM stated that it had found information constituting *"compelling confirmation"* that a toxic chemical was used *"systematically and repeatedly"* as a weapon in villages in northern Syria earlier this year.[272] The report stated that *"the descriptions, physical properties, behaviour of the gas, and signs and symptoms resulting from exposure, as well as the response of patients to the treatment, leads the FFM to conclude with a high degree of confidence that chlorine, either pure or in mixture,*

General Assembly resolution 42/37 C and Security Council 620 (1988). The purpose of this Mission was to ascertain the facts related to the allegations of use of chemical weapons, to gather relevant data, to undertake the necessary analyses for this purpose, and to deliver a report to the Secretary-General.

267 United Nations, *United Nations Mission to Investigate Allegations of the Use of Chemical Weapons in the Syrian Arab Republic Report on the Alleged Use of Chemical Weapons in the Ghouta Area of Damascus on 21 August 2013*, Note by the Secretary-General, 16th September 2013, http://www.un.org/disarmament/content/slideshow/Secretary_General_Report_of_CW_Investigation.pdf (accessed 1st June 2014), p.1.

268 *United Nations Mission Report* (16th September 2013*) op.cit.*, paragraph 27.

269 *United Nations Mission Report* (16th September 2013*) op.cit.*, paragraph 28.

270 United Nations, United Nations Mission to Investigate Allegations of the Use of Chemical Weapons in the Syrian Arab Republic, *Final report*, 12th December 2013, https://unoda-web.s3.amazonaws.com/wp-content/uploads/2013/12/report.pdf (accessed 1st June 2014).

271 OPCW, News article: *OPCW to Undertake Fact-Finding Mission in Syria on Alleged Chlorine Gas Attacks* 29th April 2014, http://www.opcw.org/news/article/opcw-to-undertake-fact-finding-mission-in-syria-on-alleged-chlorine-gas-attacks/ (accessed 18th September 2014).

272 OPCW, News article: *OPCW Fact Finding Mission: "Compelling Confirmation" That Chlorine Gas Used as Weapon in Syria,*10th September 2014, http://www.opcw.org/news/article/opcw-fact-finding-mission-compelling-confirmation-that-chlorine-gas-used-as-weapon-in-syria/ (accessed 18th September 2014).

is the toxic chemical in question."[273] Although the FFM report has not been publicly released, there appears to be no reference made to the use of any ICA weapons during these attacks.[274]

On 14th September 2013, Syria deposited the instrument of accession to the UN Secretary General, requesting to join the Chemical Weapons Convention and formally acceded to the CWC on 14th October 2013.[275] As required under the Convention, Syria declared its existing stockpile of chemical weapons and agreed to facilitate their verification and subsequent destruction under the supervision of the OPCW. Whilst certain information concerning Syria's declared chemical weapons stockpile has come to light in the reporting of the ongoing destruction programme, [276] full details of Syria's declaration have not been made public; consequently it is not known whether its declared chemical weapons stockpile included ICA weapons. There is also insufficient publicly available information to determine whether any Syrian entity is currently undertaking research into, or attempting to develop weapons employing ICAs.

The use of any toxic chemical as a weapon in armed conflict is absolutely prohibited under the Chemical Weapons Convention as well as customary international humanitarian law. To date, however, Syria has not formally affirmed that it recognises that the use of ICA weapons in such circumstances to be prohibited under the CWC. Similarly, Syria has not clarified whether and if so, under what circumstances it considers the use of ICA weapons to be permissible for law enforcement under the CWC and relevant international law. It would be beneficial if Syria, made a formal statement to the OPCW, for example at the forthcoming 19th CSP, clarifying its position on these matters.

4.2.8. UNITED KINGDOM

The United Kingdom (U.K.) Government has released a number of documents, and academic researchers have uncovered further information, detailing the country's previous attempts to

273 *Ibid.*

274 The Independent International Commission of Inquiry on the Syrian Arab Republic, acting under the auspices of the U.N. Human Rights Council, has also detailed allegations of chemical weapons use within its wider inquiry into human rights abuses. See: United Nations, General Assembly, Human Rights Council, Twenty-fifth session, *Report of the independent international commission of inquiry on the Syrian Arab Republic*, A/HRC/25/65, 12th February 2014. However, there has been no explicit reference to the allegations of ICA weapons use in its reports.

275 OPCW, Press release: OPCW to Review Request from Syria, 13th September 2013; OPCW, Executive Council, *Decision: Destruction of Syrian Chemical Weapons*,EC-M-33/DEC.1, 27th September 2013; OPCW, Press release: *Syria's Accession to the Chemical Weapons Convention Enters into Force*, 14th October 2013.

276 See for example, BBC News, *Syria's chemical weapons stockpile*, 30th January 2014, http://www.bbc.co.uk/news/world-middle-east-22307705 (accessed 12th August 2014); Zanders, J.P., Gradually making sense of Syria's CW declarations, *The Trench*, http://www.the-trench.org/syrias-cw-declarations/ (accessed 12th August 2014).

develop ICA weapons for military purposes, prior to the coming into force of the CWC.[277] U.K. activities in this area included a programme of human studies into ICAs conducted at Porton Down [the U.K. Chemical Defence Experimental Establishment], which ran from 1959 to the early 1970s.[278] This included trials with physical incapacitating agents such as oripavine derivatives[279] and psychological agents including Lysergic acid diethylamide (LSD), Lysergic acid ethylamide (LAE), BZ, tryptamines and MPIPG[280]. Following the termination of these activities, there is no public record of subsequent U.K. ICA weapons development programmes for military purposes. However, there are indications that research on ICAs continued at Porton Down into the 1980s, although the nature and purpose of such research is not known.[281]

277 For an overview of the U.K. activity in this area, see: Walker, J. *"Inappropirately hilarious": An historical overview of the interest in and use of incapacitating chemical agents*, March 2010. (Copy provided by the author). See also: Maclean, A. *Historical survey of the Porton Down volunteer programme*, Ministry of Defence, June 2006; Advisory Council on Scientific Research and Technical Development. *Minutes of the 32nd meeting of the Chemistry Committee*, 5th March 1959, as cited in British Medical Association (2007) *op.cit.*; The Secret Science of Crowd Control, *BBC Radio 4 News*, 25th June 2008, http://news.bbc.co.uk/today/hi/today/newsid_7471000/7471743.stm (accessed 9th June 2014); Dando, M. and Furmanski, M. Midspectrum Incapacitant Programs. In: Wheelis, M., Rózsa, L., and Dando, M. (Eds). *Deadly Cultures: Biological Weapons Since 1945*. Cambridge: Harvard University Press, 2006; N. Davison, *'Non-lethal weapons'*, Palgrave, 2009, pp.236-251.

278 See: Maclean, A. (2006) *op.cit.*, Part 4: Human studies with incapacitating agents, pp.109-142, http://webarchive.nationalarchives.gov.uk/20121026065214/http://www.mod.uk/NR/rdonlyres/7211B28A-F5CB-4803-AAAC-2D34F3DBD961/0/part_iv.pdf (accessed 9th June 2014). The paper contains details of the wide range of potential incapacitating chemical agents explored.

279 For a further information on Porton Down's incapacitating agent programme see: Dando, M. *The UK's Search for an Incapacitating ('Non-Lethal') Chemical Agent in the 1960s , Bradford Science and Technology Report*, January 2006; Perry Robinson, J. *Disabling Chemical Weapons: Some Technical and Historical Aspects* (paper presented to the Pugwash Study Group on Implementation of the CBW Conventions, Den Haag/Noordwijk, 27th -29th May 1994); Evans, R. *Gassed: British Chemical Warfare Experiments on Humans at Porton Down*, London: House of Stratus, 2000; *Cold War at Porton Down: the history of biochemical warfare research and human experimentation, 1945-1989*, University of Kent, http://www.kent.ac.uk/porton-down-project/index.htm (accessed 11th August 2014).

280 A substance then referred to as T3436 by Porton Down, and now known as N-methyl-4-piperidyl-isopropyl-phenol glycolate. See: Maclean, A. (2006) *op.cit.*, p.119. This substance was also explored in the U.S. ICA weapons programme during the 1970s, where it was termed EA 3834. It was considered as a possible "follow-on" agent to BZ. For further discussion see: Perry Robinson, J. (2012) *op.cit.*, entries 730100, 730523 and 760200.

281 To date, no details of this work have been released by the U.K. However, three U.K. research papers on fentanyl and related analgesic chemicals produced by the Chemical Defence Establishment were cited in: *Agent Research Studies: 1966-1990*, U.S. Army Armament Munitions Command, Chemical Research, Development & Engineering Center, Aberdeen Proving Ground MD, report CRDEC-TR-345, April 1992, declassified with redactions from CONFIDENTIAL. The three U.K. papers were: Chemical Defence Establishment, Porton Down, *Fentanyl and Related Anilidopiperidine Analgesics. A Review*, Technical Note No 466, May 1981, marked CONFIDENTIAL; Chemical Defence Establishment, Porton Down, *Awareness of Potential Agents – Some Potent Pharmacologically Active Compounds. A Review*, Technical Note No 490, November 1981, marked RESTRICTED; *Recent Developments in the Chemistry and Pharmacology of Fentanyls. A Review*, Technical Note No 715, June 1985, marked SECRET. For further details and discussion, see: Perry Robinson, J. (20th November 2012) *op.cit.*, entry 811100.

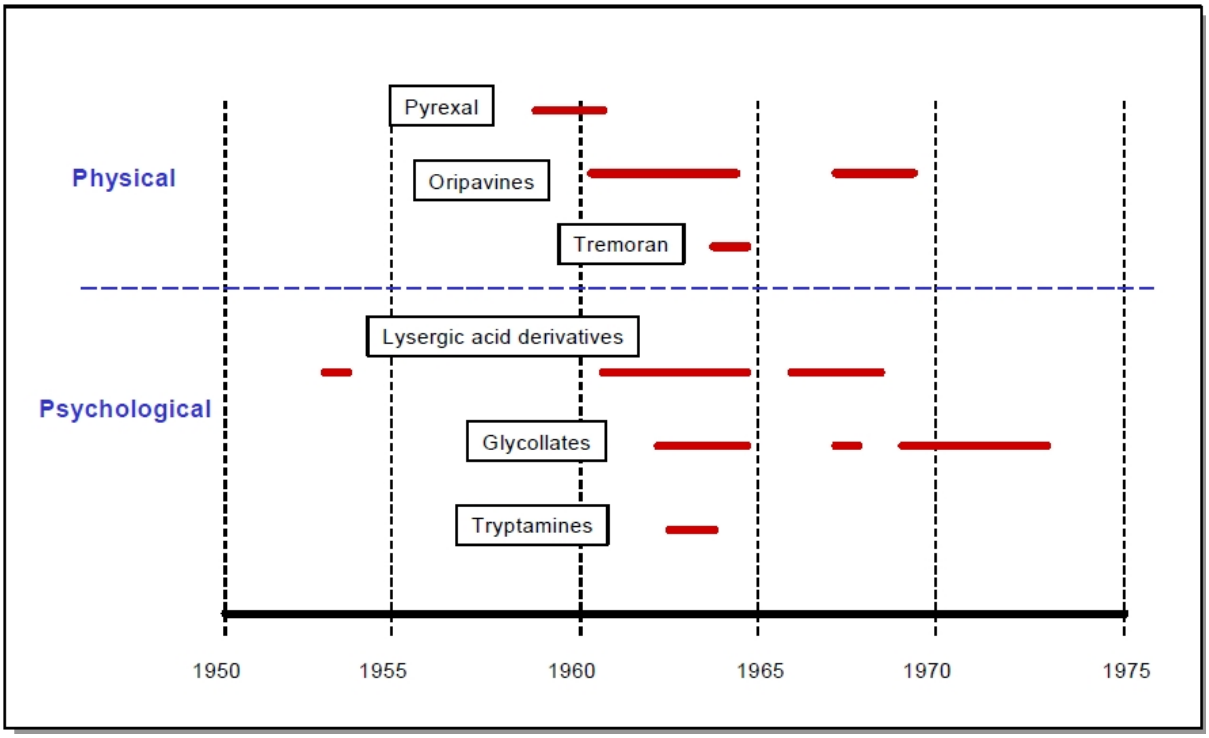

Figure 11: Chart summarising the range of potential incapacitating chemical agents explored during a programme of human studies into ICAs conducted at the U.K. Chemical Defence Experimental Establishment, from 1959 to the early 1970s. Taken from Maclean, A. *Historical survey of the Porton Down volunteer programme*, Ministry of Defence, June 2006.

In the early-to-mid-2000s, there were indications that the U.K. Government was assessing the feasibility of employing weapons, which it termed "calmatives" or "tranquillisers", for certain law enforcement purposes.[282] These assessments took place as part of a wide-ranging review of the "less lethal" technologies that could potentially be employed by U.K. police forces following recommendations from a study [the Patten Report] highlighting limitations in public order policing in Northern Ireland.[283] The review was overseen by a Steering Group[284] which was tasked with establishing *"whether a less potentially lethal alternative to baton rounds is available"* and

282 Donnelly, T. *Less Lethal Technologies: Initial Prioitization and Evaluation*, U.K. Home Office, Policing and Crime Reduction Group, Police Scientific Development Branch, publication no.12/01, http://icpra.org/sites/default/files/Documents/Library/Police%20Federation%20of%20England%20and%20Wales/4PSDB_Less_Than_Lethal_Technology.pdf (accessed 1st June 2014).

283 *A New Beginning: Policing in Northern Ireland, The Report of the Independent Commission on Policing for Northern Ireland*, September 1999, available at: http://cain.ulst.ac.uk/issues/police/patten/patten99.pdf (accessed 1st June 2014).

284 The Group comprised representatives from Her Majesty's Inspectorate of Constabulary, the Home Office, the Association of Chief Police Officers, the Ministry of Defence, the Police Authority for Northern Ireland, the Police Scientific Development Branch (PSDB) of the Home Office and the RUC, and was chaired by the Northern Ireland Office. See: Patten Report Recommendations 69 and 70 Relating to Public Order Equipment: A Paper prepared by the Steering Group led by the Northern Ireland Office, April 2001, Northern Ireland Office, U.K. Government. Available at: http://www.patfinucanecentre.org/policing/plastic/phase1rp.pdf (accessed 11th August 2014).

reviewing *"the public order equipment which is presently available or could be developed in order to expand the range of tactical options available to operational commanders."*[285]

As part of this multi-phase assessment process, the Police Scientific Development Branch (PSDB) of the Home Office produced a report in February 2001 for the Northern Ireland Office (NIO) which comprised a literature review of "less lethal" technologies and currently available or near market commercial devices, set against the context of Operational Requirements established by the Association of Chief Police Officers (ACPO). The report stated that: *"Other chemical means of incapacitation include the use of tranquillisers and anaesthetics. Different people will react differently to anaesthetics and the dose required to incapacitate one person may prove harmful to another."*[286]

In July 2001, ACPO and NIO classified the range of "less lethal" technologies as: category A – devices warranting immediate more in-depth research, category B – devices requiring long term research, or category C – devices not considered of immediate interest or importance. ACPO and NIO initially concluded that tranquillisers should be considered as a Category B technology, namely *"Devices warranting further research over a more extended time frame"*[287]

In December 2001, the PSDB produced another report surveying potential "less lethal" technologies[288], which was subsequently incorporated into a report of the Steering Group.[289] With regard to ICAs, the PSDB briefly reviewed U.S. research into *"tranquillisers and delivery methods"* conducted during the late 1980s and early 1990s. [290] PSDB noted that: *"One class of tranquilliser was identified as having a large safety margin between the onset of unconsciousness and death as well as possessing rapid antidotes. However, the substance also caused muscle relaxation and consequently could cause a person's breathing to stop."* [291] The PSDB stated that *"the Department of Health* [had] *been consulted and although they say they could not comment*

285 Steering group terms of reference detailed in: Northern Ireland Office (April 2001) *op.cit*., paragraph.6.
286 The findings of the PSDB report are contained in the first report of the Steering Group. See: Northern Ireland Office (April 2001) *op.cit*., paragraph 59, p.15.
287 For further discussion see: Donnelly, T. (2001) *op.cit.*, Appendix A: Suggested priorities for further research
288 Donnelly, T. (2001) *op.cit.*
289 *Patten Report Recommendations 69 and 70 Relating to Public Order Equipment: A Research Programme into Alternative Policing Approaches Towards the Management of Conflict*, Second Report prepared by the Steering Group led by the Northern Ireland Office, in consultation with the Association of Chief Police Officers, December 2001, available at: http://www.patfinucanecentre.org/policing/plastic/phase2rp.pdf (accessed 11th August 2014).
290 Donnelly, T. (2001) *op.cit.*, p.47. See also: Northern Ireland Office (December 2001) *op.cit.*, p.95.
291 Donnelly, T. (2001) *op.cit.*, p.47. See also: Northern Ireland Office (December 2001) *op.cit.*, p.95.

without specific details of the type of drug being considered they did say that the idea of using tranquillisers was fraught with the difficulties identified by the Americans."[292]

Subsequently, in January 2004, the Steering Group published its findings with regard to the potential utility of public order equipment, in relation to ACPO's Operational Requirements.[293] Chapter 9 of the report provided further details of PSDB's literature-based research into so-called "calmatives" and "malodorants", which concluded that neither of these technologies met all areas of ACPOs Operational Requirements, and that *"serious failings were observed particularly regarding safety of the subject and the duration and level of incapacitation to be expected."* [294] The Steering Group consequently concluded that:

> *"Use of calmatives in policing situations would not be a straightforward process. The decision to use any drug whether intended to induce a state of calm or complete unconsciousness requires knowledge of a subject's medical history, particularly the use of any prescribed or non-prescribed medication and any relevant medical conditions. There would also be considerable responsibility in terms of immediate and post-incident aftercare."*[295]

The Steering Group report quoted the PSDB recommendation that *"further research into this area is not justified at the present time".*[296] Consequently, the Steering Group concluded that *"On the basis of the arguments and observations presented, the Steering Group has decided to move the work on calmatives from Category B to Category C, indicating that further research is not required at present."*[297] However, the Steering Group report did record that the PSDB would *"continue to monitor U.S. research in this area and notify the Steering Group of significant developments".*[298] Furthermore, the Steering Group also recommended the continued monitoring of: *"this area, focusing on international research programmes and future developments in delivery methods and potential tranquilising agents."*[299]

There is no evidence that the U.K. has subsequently sought to develop weapons employing ICAs for either military or law enforcement purposes. There are indications that U.K. scientists based at Porton Down have conducted research into ICAs for protective purposes, as permitted under the

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292 Donnelly, T. (2001) *op.cit.*, p.47. See also: Northern Ireland Office (December 2001) *op.cit.*, p.95.

293 Northern Ireland Office, *Patten Report Recommendations 69 and 70 Relating To Public Order Equipment. A Research Programme Into Alternative Policing Approaches Towards The Management of Conflict*. Fourth Report prepared by the Steering Group led by the Northern Ireland Office, in consultation with the Association of Chief Police Officers. Belfast: Northern Ireland Office, January 2004. Available at: http://www.patfinucanecentre.org/policing/plastic/phase4rp.pdf (accessed 11th August 2014).

294 Northern Ireland Office (2004) *op.cit*, p.126, paragraph 3.

295 Northern Ireland Office (2004) *op.cit*, p.129, paragraph 30.

296 Northern Ireland Office (2004) *op.cit*, p.126, paragraph 4.

297 Northern Ireland Office (2004) *op.cit*, p.129, paragraph 31.

298 Northern Ireland Office (2004) *op.cit*, p.126, paragraph 4.

299 Northern Ireland Office (2004) *op.cit*, p.129, paragraph 31.

CWC. On 25th July 2014, in correspondence to BNLWRP, the U.K. Counter Proliferation Department outlined the purpose of the U.K.'s overarching research into chemical agents for protective purposes:

> *"The chemical research programme covers a number of potential threat materials and attempts to understand the physical and chemical properties of the agent, how the material might be disseminated, the toxicological effects of the agents, how we might detect and identify the agent, what would be the physical protective measures required to mitigate exposure to the material and whether or not there is a need to develop specific antidotes (or medical countermeasures) to the agent. All research work conducted in the UK is compliant with the UK's international legal obligations, including the CWC. Information about such research is included in the annual information provided to the OPCW under Article X, Paragraph 4 of the CWC."*[300]

In February 1998, the U.K. Defence Secretary released information indicating that the Ministry of Defence (MOD) was conducting *"an assessment of the relevant scientific and background information"*[301] concerning alleged (but unconfirmed) Iraqi possession of an ICA weapon. In April 1998, a U.K. Defence Minister stated *"we are currently reviewing all available information on this agent and related compounds, with the assistance of CBD Porton Down. No laboratory work is being carried out at present."* [302] In November 1999, the U.K. released a report recording that Porton Down had previously conducted research on glycolates and related compounds from 1962 to 1974; and that in 1998 it performed *"some animal studies"* but no *"studies involving human subjects*" on Agent-15.[303]

In 2012, DSTL researchers published a comprehensive paper detailing their attempts to identify the chemical agents employed by the Russian Federation security forces as an ICA weapon during the Moscow theatre siege of October 2002[304]. Analysis by the current authors of the U.K.'s annual Article X reports to the OPCW detailing its chemical weapon

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300 Correspondence to Dr M.Crowley, BNLWRP, from Mr D. Shepherd, Deputy Head, Counter Proliferation Department, Foreign and Commonwealth Office, United Kingdom, 25th July 2014.

301 Iraq CW capability during the Gulf War: Agent 15, Ministry of Defence, 9th February 1998. [Hard copy available from House of Commons Library].

302 *Hansard* (House of Commons), Written Answers to Questions, 22nd April 1998, column 650, Dr John Reid in response to Mr Ken Livingston.

303 Biomedical Sciences Department, CBD Sector [of Defence Evaluation and Research Agency] Porton Down, *An Overview of Research carried out on Glycollates and Related Compounds at CBD Porton Down*, DERA/CBD/CR990418, September 1999 (copy held at the Sussex Harvard Information Bank, file A1837) [A hard copy of the Porton Down report is available from House of Commons Library], paragraph 2.2. Email correspondence from Prof. J. Perry Robinson (Harvard Sussex Program) to Dr M. Crowley (BNLWRP) 7th October 2014.

304 Riches, J. R.; Read, R. W.; Black, R. M.; Cooper, N. J.; Timperley, C. M., Analysis of clothing and urine from Moscow theatre siege casualties reveals carfentanil and remifentanil use, *Journal of analytical toxicology*, volume 36, issue 9, November 2012.

protection programme,[305] found no information concerning the U.K. studies relating to the alleged Iraqi ICA weapon, but its work identifying the weaponised ICAs employed by the Russian Federation was cited in its annual report covering 2011.[306]

In April 2013, the U.K. formally clarified its position with regard to the development and use of ICA weapons, in a statement delivered by Mr Alistair Burt, Under Secretary of State for Foreign and Commonwealth Affairs, to the Third CWC Review Conference:

> *"The definition of chemical weapons and toxic chemicals in the Convention's Article II is clear. All incapacitating toxic chemicals fall within its scope. We see the same understanding reflected in the Guidelines for Schedules for Chemicals. Moreover, the types and quantities of toxic chemicals must always be consistent with the purposes not prohibited under the Convention; these include law enforcement whether domestic or international. These definitions apply to future developments, not only the present. That is our safeguard. We should be grateful to the negotiators for their foresight."*
>
> *"In addition, the UK believes we should work together to establish a norm to discourage the use of chemicals more toxic than Riot Control Agents for law enforcement and consider transparency measures or limitations."*
>
> *"I should also like to take this opportunity today to state unequivocally that the UK neither holds, nor is developing, any incapacitating chemical agents for law enforcement. We encourage all other States Parties to state their positions on this question."*[307]

4.2.9. United States

The United States of America (U.S.) has a long history of research potentially applicable to the study and development of weapons employing incapacitating chemical agents, dating back to the 1950s.[308] Among the agents explored by the U.S. military in the 1960s was BZ (3-quinuclidinyl

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305 A copy of all the annual Article X declarations submitted by the U.K. Government to the OPCW Technical Secretariat covering calendar years from 1997 to 2013 were provided to the authors by the U.K. Government. The U.K. Government released a copy of its first (1997) annual Article X declaration to the OPCW in a response to a Parliamentary Question, and deposited a hard copy in the House of Commons library [See: U.K. Ministry of Defence, Monday 27th April 1998 response of Secretary of State for Defence, Dr J.Reid to Parliamentary Question by Mr R. Sedgemoor, *Hansard*, 26671].Hard copies of subsequent U.K. annual Article X declarations have also been deposited in the House of Commons library.

306 United Kingdom, Format for the annual reporting of information on national programmes for protection against chemical weapons, under Article X of the Chemical Weapons Convention, Annex A, 29th February 2012, p.5.

307 OPCW, Conference of States Parties, United Kingdom: *Statement by Mr Alistair Burt, Parliamentary Under Secretary of State for Foreign and Commonwealth Affairs*, Third Review Conference, RC-3/NAT.22, 8th – 19th April 2013, 9th April 2013.

308 For further discussion of historical U.S. ICA weapons research, see for example: Dando, M. and Furmanski, M. Midspectrum Incapacitant Programs, in: Wheelis, M., Rózsa, L., and Dando, M. (Eds). *Deadly Cultures: Biological Weapons Since 1945*. Cambridge: Harvard University Press, 2006; Davison, N. *Bradford Science and Technology Report No. 8'Off the Rocker' and 'On the Floor': The Continued Development of Biochemical Incapacitating Weapons*, August 2007*;* Furmanski, M. Historical military interest in low-lethality biochemical agents, in: Pearson, A., Chevrier, M. and Wheelis, M. (2007) *op.cit.*; Pearson, A. Late and Post-Cold War Research and Development of Incapacitating Biochemical Weapons, in: Pearson, A. Chevrier M. & Wheelis

benzilate). Approximately 60,000 kilograms (130,000 pounds) of BZ were manufactured and the agent was weaponised in two munitions – the 175-lb M44 generator cluster and the 750-lb M43 cluster bomb[309] - that entered the U.S. arsenal in 1964.[310] Although the U.S. military proposed initiating use of BZ along with CS in the Vietnam war,[311] there were no confirmed reports that BZ was ever utilised by U.S. forces in armed conflict. [312]

M. (2007) *op.cit*; Perry Robinson, J. *Disabling Chemical Weapons: A Documented Chronology of Events,* 1945-2011 (copy provided by author), 20th November 2012

309 According to a U.S. Army munitions manual, the M43 cluster munition was designed for: *"aerial delivery of 57 M138 10-pound BZ incapacitating agent bombs on selected targets to temporarily incapacitate enemy personnel. Inhaling BZ causes temporary slowing of mental and physical activity, disorientation, and hallucinations among exposed personnel.* [*Technical manual, U.S. Army, equipment data sheets, chemical weapons and munitions*, TM 43-0001-26-2, Department of the Army, Washington, DC, 29th April 1982. p.l-5.]

310 Furmanksi, M. (2007) *op.cit.* p.54.

311 HQ U.S.M.A.V., *Command History* 1964, volume 35, p.133, as cited in: Furmanksi, M. (2007) *op.cit.* p.54.

312 Perry Robinson has documented a number of unconfirmed reports of BZ employment by U.S. military forces. In March 1966, the French weekly *L'Express* reported an operation in Binh Dinh province of South Vietnam by the U.S. First Cavalry Division (Airmobile), apparently during Operation WHITE WING, in which 15 helicopters had dropped 3000 BZ-filled grenades onto an encircled "Vietcong" battalion. *[See: Pierre Darcourt, L'Express, 14th - 20th March 1966, pp. 37-38, "Vietnam: Le temps des massacres*"]. This was repeatedly denied by U.S. officials in Saigon and Washington DC. [See: Seymour M Hersh, *Chemical and Biological Warfare: America's Hidden Arsenal*, London: MacGibbon & Kee (1968) pp 185-86.] The episode was later included as the first in a list of four occasions up to 1970 in which U.S. troops are said to have used BZ in South Vietnam. [See: "*Some data on U.S. chemical warfare in South Vietnam 1969-1970*", a paper presented by an NLF delegate at the *Réunion internationale de Scientifiques sur la Guerre chimique au Vietam*, Paris: Faculté des Sciences d'Orsay, 12 December 1970.]. This information is recorded in: Perry Robinson, J. (20th November 2012) *op.cit.*, entry 660314].

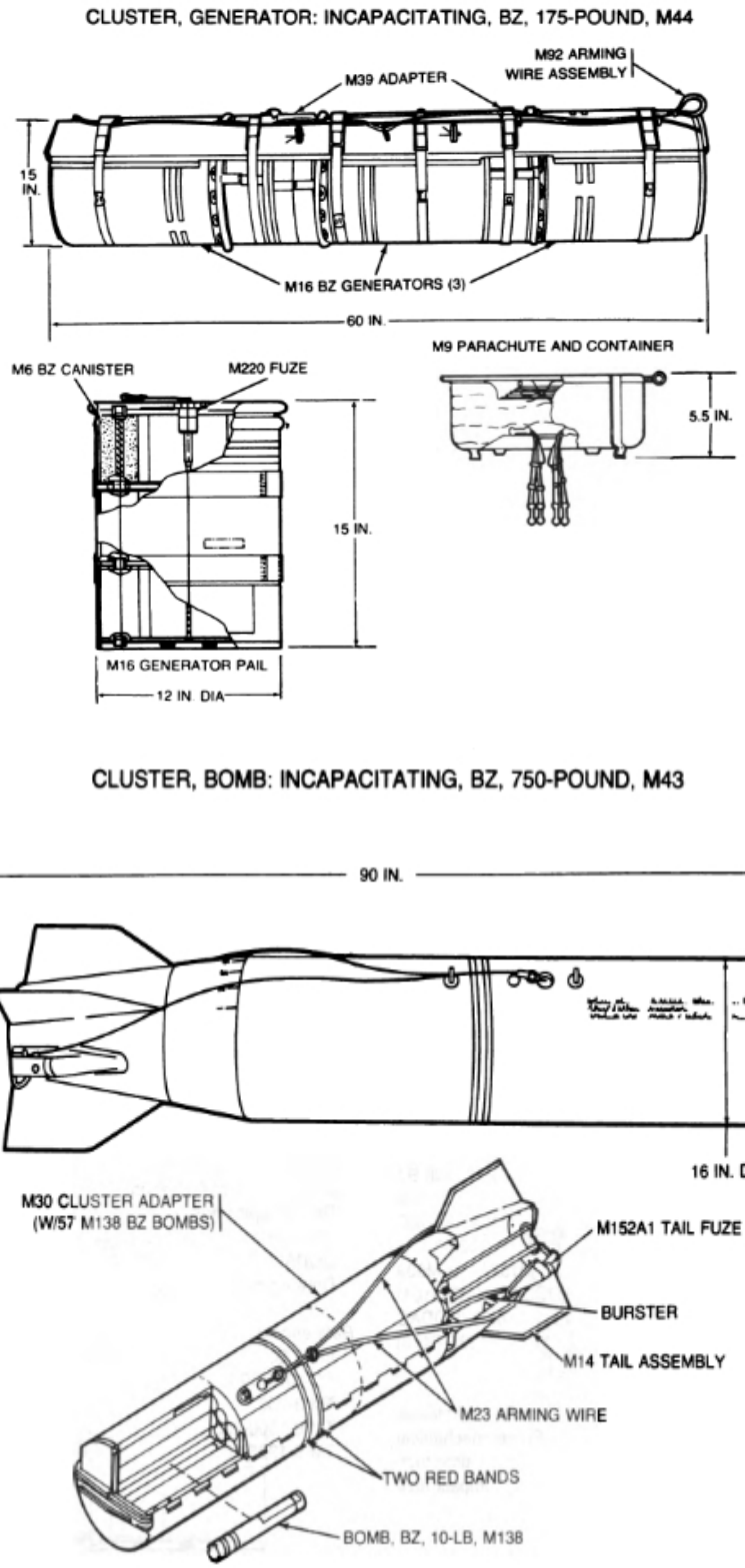

Figure 9: Images of the 175-lb M44 generator cluster (top) and the 750-lb M43 cluster bomb (bottom) – the two BZ munitions developed by the U.S. Military in the early 1960s, which entered the U.S. Arsenal in 1964. Images taken from *Technical manual, U.S. Army, equipment data sheets, chemical weapons and munitions*, TM 43-0001-26-2, Department of the Army, Washington, DC, 29th April 1982. (pp14, 16).

From 1955 to 1975, the U.S. military and contractors from the U.S. pharmaceutical industry and elsewhere[313] conducted research into a wide range of other ICAs with potential weapons utility, many of which were tested on U.S. military volunteers.[314] In the late 1970s, the U.S. Army conducted some advanced development including work on a pilot plant for production of the glycolate EA 3834A and a filling facility for a XM96 66mm ICA rocket warhead, although these munitions do not appear to have entered the U.S. arsenal.[315] From the late 1970s onwards there is no evidence of further advanced large-scale ICA weapons development. BZ was removed from the U.S. arsenal; the stockpile of BZ was eventually destroyed by incineration between 1988 and 1990, and the BZ filing plant subsequently destroyed in 1999.[316]

It does appear, however, that research into ICA weapons continued prior to and following, the signing and coming into force of the Chemical Weapons Convention. In 1992, the U.S. Army Chemical Research, Development & Engineering Center (CRDEC) published a lengthy review of the chemical agent research studies it and its contractors had undertaken during 1966 through 1990 – including those related to ICAs[317]. In 1992, CRDEC researchers also published technical reports on *Dissociation of opiate-induced sedation and respiratory depression by opiate antagonist*

313 For a discussion of the involvement of U.S. pharmaceutical and chemical companies, and research institutes in the U.S. military ICA weapons development programme at this time, see: Perry Robinson, J. (20th November 2012*) op.cit*., entries 611100, 660600, 670600, 680600, 690800.

314 U.S. Army Department *List of Agents Used on Human Volunteers*, 12th August 1975, tabled in evidence at the joint hearing of Senate Judiciary Subcommittee on Administrative Practice and Procedure and Senate Labor and Public Welfare Subcommittee on Health, 10 and 12 September and 7 November 1975, *Biomedical and Behavioral Research, 1975: Human-Use Experimentation Programs of the Department of Defense and Central Intelligence Agency*, p 1142, as cited in: Perry Robinson, J. (20th November 2012*) op.cit.* Annex I contains an excerpted table of the wide-range of chemical and biological agents tested over this period. In addition, Annex 3 of Perry Robinson's Chronology also contains a list of ICAs held in a CIA store. This was taken from the inventory reproduced in: U.S. Senate, *Select Committee to Study Governmental Operations with respect to Intelligence Activities*, hearings, 16-18 September 1975, Unauthorized Storage of Toxic Agents, pp. 12 & 192-197.

315 Perry Robinson, J. (20th November 2012*) op.cit.*, chronology reference: 761000, p.85.

316 Dando, M. and Furmanski, M. (2006) *op.cit.*, p.250.

317 *Agent Research Studies: 1966-1990*, U.S. Army Armament Munitions Command, Chemical Research, Development & Engineering Center, Aberdeen Proving Ground MD, report CRDEC-TR-345, April 1992, declassified with redactions from CONFIDENTIAL, as cited in Perry Robinson, J. (20th November 2012*) op.cit.*, entry 920400. This study appears to have updated a previous review undertaken by Dr Benjamin Witten of the Organic Chemistry Department, Edgewood Arsenal. See: Witten, B. *The Search for Toxic Chemical Agents*, Army Edgewood Arsenal technical report for period ending July 1966, EATR 4210, November 1969 [DTIC document AD 507852], declassified from CONFIDENTIAL, as cited and discussed in Perry Robinson, J. (20th November 2012*) op.cit.*, entry 660700.

coadministration and *Coadministration of sufentanil and nalmefene: drug plasma concentrations and relationship to pharmacologic effects.*[318]

In December 1999, the U.S. Army's Edgewood Chemical Biological Center (ECBC) solicited research proposals for a three phase project - CBD00-108 Chemical Immobilizing Agents for Non-lethal Applications - the objective of which was to: *"demonstrate the feasibility of a safe, reliable chemical immobilizing agent(s) for non-lethal (NL) applications in appropriate military missions and law enforcement situations."*[319] Under Phase 1 of this programme researchers would *"conduct an analysis of promising new chemical immobilizing agents or combinations of agents"* including *"recent breakthroughs in the pharmacological classes such as anesthetics/analgesics, tranquilizers, hypnotics and neuromuscular blockers."*[320] Researchers would *"conduct a toxicological test program"* with the *"most promising"* new immobilizing agents to fill data gaps and consequently *"establish the mode of immobilization, the effective dose(age) for immobilization, onset time and duration of effects, and safety ratio in the most appropriate animal species."* [321]

Under Phase 2, input would be gathered from potential military and law enforcement users on the desired performance/operational characteristics; and the implications of the Chemical Weapons Convention for proposed scenarios of use would be determined. Following the selection of the *"optimum scenario(s) of use"* a series of *"non-human primate and clinical tests"* would be conducted *"to establish safety and performance characteristics"*. [322] Subsequently an *"appropriate delivery technique"* for example, *"an aerosol generator for dissemination for the inhalation route of entry, or a dart for injection in the intra-muscular route of entry"* would be designed and demonstrated. Under Phase 3 dual-use applications of the technology were to be analysed.[323] The potential military uses cited included: *"meeting U.S. and NATO objectives in peacekeeping missions; crowd control; embassy protection; rescue missions; and counter-terrorism."* [324] The potential law enforcement uses highlighted included: *"hostage and barricade situations; crowd control; close proximity encounters...to halt fleeing felons; and prison riots."* [325] In June 2000,

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318 Respectively CRDEC-TR-339 and CRDEC-TR-340, both dated April 1992 and authored by R J Mioduszewski, S A Ruetter, R A Crowley and R Pullen, as reported in the CRDEC newsletter *ChemNotes* no 41, October 1992, and cited in Perry Robinson, J. (20th November 2012*) op.cit.*, entry 920400.

319 United States Army, Topic CBD00-108, *Chemical Immobilizing Agents for Non-lethal Applications, Small Business Innovation Research Solicitation,* CBD 00.1, December 1999 http://web.archive.org/web/20070213055848/http://www.acq.osd.mil/osbp/sbir/solicitations/sbir001/cbd001.htm (accessed 11th August 2014).

320 United States Army, SBIRS CBD00-108 (December 1999) *op.cit.*

321 United States Army, SBIRS CBD00-108 (December 1999) *op.cit.*

322 United States Army, SBIRS CBD00-108 (December 1999) *op.cit.*

323 United States Army, SBIRS CBD00-108 (December 1999) *op.cit.*

324 United States Army, SBIRS CBD00-108 (December 1999) *op.cit.*

325 United States Army, SBIRS CBD00-108 (December 1999) *op.cit.*

ECBC awarded a contract for Phase 1 of this project to OptiMetrics, Inc. [326] In November 2002, it was reported that Phase 1 had been completed.[327] It is not known whether Phase 2 or 3 were ever undertaken and if so, when or by whom.

In 2000, the Applied Research Laboratory and the College of Medicine at Pennyslvania State University published the results of its literature study and analysis of bio-medical research into a range of pharmaceutical agents including *"sedative-hypnotic agents, anesthetic agents, skeletal muscle relaxants, opioid analgesics, anxiolytics, antipsychotics, antidepressants and selected drugs of abuse"* which attempted to *"assess the potential use of calmatives as non-lethal techniques"*.[328] The report identified ten classes of pharmaceutical agents and 32 representative agents or agent combinations as having a *"high potential for further consideration as a non-lethal technique*" (see Table 3).[329]

326 United States Army, CBD,26 Phase I Selections from the 00.1 Solicitation http://web.archive.org/web/20101123094323/http://dodsbir.net/selections/abs001CBD.htm (accessed 11th August 2014).

327 Ruppe, D. United States: U.S. Military Studying Nonlethal Chemicals, *Global Security Newswire*, 4th November 2002, http://web.archive.org/web/20100411131618/http://www.nti.org/d_newswire/issues/2002/11/4/7p.html (accessed 11th August 2014).

328 Lakoski J., Bosseau Murray, W. & Kenny, J., 2000, *The advantages and limitations of calmatives for use as a non-lethal technique*, College of Medicine Applied Research Laboratory, Pennsylvania State University, p.2.

329 Lakoski J., Bosseau Murray, W. & Kenny, J., (2000) *op.cit.*, pp.15-45.

Table 3: Indicative drug classes and agents highlighted in the Penn State University Report as having potential utility as ICA weapons [330]

Drug class	**Selected compounds**	**Site of action**
Benzodiazepines	Diazepam, Midazolam, Etizolam, Flumazenil (antagonist)	GABA receptors
Alpha$_2$ Adrenergic Receptor Agonists	Clonidine, Dexmedetomidine Fluparoxan (antagonist)	Alpha$_2$-adrenergic receptors
Dopamine D3 Receptor Agonists	Pramipexole Cl-1007 PD 128907	D3 receptors
Selective Serotonin Reuptake Inhibitors	Fluoxetine Sertraline Paroxetine WO-09500194	5-HT transporter
Serotonin 5-HT$_{1A}$ Receptor Agonists	Buspirone Lesopitron Alnespirone MCK-242 Oleamide WAY-100, 635	5-HT$_{1A}$ receptor
Opioid Receptors and Mu Agonists	Morphine Carfentanil Naloxone (antagonist)	Mu opioid reception
Neurolept Anaesthetics	Propofol, Droperidol and Fentanyl combination, Phencyclidines	GABA receptors DA, NE and GABA receptors Opioid receptors
Corticotrophin-Releasing Factor Receptor Antagonists	CP 154,526 (antagonist) NBI 27914 (antagonist) CRF-BP (binding protein)	CRF receptor
Cholecystokinin B Receptor Antagonists	CCK-4 Cl-988 (antagonist) Cl-1015 (antagonist)	CCKB receptor

330 Adapted from: Lakoski J., Bosseau Murray W. & Kenny J. (2000) o*p.cit.*, pp.15-16.

In fiscal year 2001, the National Institute of Justice (NIJ) funded a three phase project on 'non-lethal' weapons at the Institute for Non-Lethal Defense Technologies (INLDT) at Pennsylvania State University (PSU). Phase two of the project was to *"…conduct an investigation of controlled exposure to calmative-based oleoresin capsicum."*[331] Although publicly available information regarding this project is scarce, it apparently involved the combination of an ICA with the chemical irritant oleoresin capsicum in order to produce more profound effects. [332]

In 2003, the National Research Council (NRC) issued a report reviewing prior and existing 'non-lethal' weapons (NLW) research, examining relevant scientific and technological developments and recommending future areas of NLW research.[333] Whilst the report highlighted concerns regarding compliance with the CWC, the National Research Council panel recommended *"increase[d] research in the field of human response to calmatives."* They stated that: *"Calmatives have potential as NLWs ['non-lethal' weapons] in many types of missions where calming of individuals or crowds is needed."* The panel recommended that *"The human effects of these compounds and their safety must have thorough evaluation under conditions simulating their mission uses."*[334]

In 2004, the U.S. Department of Defense Science Board released a report on *Future Strategic Strike Forces* which proposed exploring the use of ICA weapons. In a section surveying payloads, the report stated that *"Calmatives might be considered to deal with otherwise difficult situations in which neutralizing individuals could enable ultimate mission success. The principle technical issue is the balance between effectiveness (i.e., the targets are truly "calmed") and margins of safety (i.e., avoiding overexposure and resulting fatalities of neutral bystanders)."* Although the report noted that: *"The Treaty implications are significant,"*[335] it subsequently stated that *"Applications of biological, chemical or electromagnetic radiation effects on humans should be pursued."*[336] And

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331 National Institute of Justice, Grant No. 2001-RD-CX-K002. Details from NIJ Research Portfolio available December 2006 at: http://nij.ncjrs.org/portfolio/ as cited in Davison, N. (2007) *op.cit,* p.24.

332 In February 2003, a presentation by the Senior Program Manager for the NIJ Less-Than-Lethal Technology Program, indicated that the project had been reviewed by a liability panel and that work was progressing at Pennsylvania State University. Cecconi, J. (2003) Less-Than-Lethal Program. *Presentation to the 2003 National Institute of Justice Annual Technology Conference*, as cited in Davison, N. (2007) *op.cit,* p.24.

333 National Research Council, *An Assessment of Non-Lethal Weapons Science and Technology*, Committee for an Assessment of Non-Lethal Weapons Science and Technology, National Research Council, Division on Engineering and Physical Sciences, Naval Studies Board Washington, DC: National Academies Press, 2003.

334 National Research Council (2003) *op.cit*, p.107.

335 U.S. Department of Defense, Defense Science Board, *Report of the Defense Science Board Task Force on Future Strategic Strike Forces.* Washington, DC: Office of the Under Secretary of Defense For Acquisition, Technology, and Logistics, February 2004, http://web.archive.org/web/20051112004639/http://www.acq.osd.mil/dsb/reports/fssf.pdf (accessed 11th August 2014), Chapter 7, p.12.

336 Defense Science Board (2004) *op.cit.* Chapter 7, p.18.

that *"R&D into sophisticated psychological operations designed to change the minds of individuals or the populace is needed."*[337]

Although there previously have been claims that U.S. Special Forces were equipped with a form of *"knock-out"* gas[338], these have not been substantiated. There is currently no publicly available evidence that the U.S. developed or stockpiled weapons containing ICAs for military (or indeed police) use, other than those it stockpiled during 1960-75, and which it later destroyed.[339] Indeed, an unnamed U.S. official interviewed by *Arms Control Today* following the Second CWC Review Conference in April 2008 stated that: *"We have no programs to develop incapacitants and got rid of our stockpiles."*[340] Similarly, a U.S. military official when questioned about research into behavioural modifiers stated in a November 2007 *Defence Technology International* article that: *"The Defense Department's Non-Lethal Weapon Program is not exploring any compound, device or system with the capabilities as described."*[341]

There were, however, subsequent indications that interest in developing ICA weapons for law enforcement continued. In April 2007, the NIJ convened a *"community acceptance panel"* to discuss the potential role of *"calmative agents"* in law enforcement.[342] The panel - which was comprised of experts from the scientific, toxicological and bio-ethical communities, as well as representatives from civil rights and human rights advocacy organisations and the legal and law enforcement communities[343] - was tasked with *"assessing the potential of developing new riot*

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337 Defense Science Board, (2004) *op.cit*, Chapter 7, p.18.

338 Wheelis, M., Non-Lethal Chemical Weapons: A Faustian Bargain, *Issues in Science and Technology*, Spring 2003, http://www.issues.org/19.3/wheelis.htm (accessed 11th August 2014); See also article by Seymour Hersh quoting a former high-level Defense Department official as stating *"We can do things on the ground, too, but it's difficult and very dangerous—put bad stuff in ventilator shafts and put them to sleep."* Hersh, S., The Iran Plans, *New Yorker*, April 2006. http://www.newyorker.com/magazine/2006/04/17/the-iran-plans (accessed 11th August 2014).

339 Dando, M. and Furmanski, M. (2006) *op.cit;* Furmanski, M., (2007) *op.cit.*

340 Meier, O. CWC Review Conference Avoids Difficult Issues, *Arms Control Today*, May 2008, http://www.armscontrol.org/act/2008_05/CWC (accessed 11th August 2014).

341 Dumiak, M. Drugs May Decrease Will To Fight, *Defense Technology International*, November 2007, http://www.aviationweek.com/aw/ generic/story_generic.jsp?channel=dti&id=news/ dtiDRUGS.xml&headline =Drugs%20May%20Decrease%20Will%20to%20Fight, (accessed 30th July 2009).

342 See: National Institute of Justice, Community Acceptance Panel – Riot Control Agents, 30th April 2007, http://www.nij.gov/topics/technology/less-lethal/pages/riot-control-agents.aspx (accessed 11th August 2014); Weiss, D. Calming Down: Could Sedative Drugs Be a Less-Lethal Option?, *NIJ Journal no.261*, *www.ncjrs.gov/pdffiles1/nij/224083.pdf* (accessed 11th August 2014), pp.42-46; Davison, N. (2009) Marketing new chemical weapons, *Bulletin of the Atomic Scientists*, 29th June 2009, http://www.thebulletin.org/web-edition/op-eds/marketing-new-chemical-weapons (accessed 4th September 2009).

343 It is notable that the panel included the Director of the Joint Non-Lethal Weapons Directorate (JNLWD), the Riot Control Agents Program Manager from the US Army RDECOM-ARDEC, and the Associate Director of the Institute for Non-Lethal Defense Technologies, Pennsylvania State University, who had been one of the authors of the 2000 Pennsylvania State Report exploring the utility of a range of potential ICAs. Details of the panel's 26 members can be found at http://www.nij.gov/topics/technology/less-lethal/pages/riot-control-agents.aspx (accessed 11th August 2014).

control agents,[344] *such as chemical calmatives, as a viable addition or alternative to the law enforcement less lethal arsenal."* It was envisaged that "*such less lethal options would be delivered in situations and in a manner similar to pepper balls or OC (Oleoresin Capsicum), except the resulting effects would be designed to calm rather than irritate the target."*[345]

According to an NIJ report of the meeting, the panel reached *"general consensus"* that law enforcement officers need additional 'less-lethal' options and that *"pursuing new or updating existing research on the safety and viability of calmative agents was reasonable...It is important to note that the panel did not determine whether a tool could be developed, only that further research was an appropriate next step."*[346] The NIJ subsequently awarded Pennsylvania State University $250,000 under grant 2007–DE–BX–K009 [347] to *"explore the potential of operationalizing calmatives and to examine possible pharmaceuticals, technologies and legal issues."*[348]

Further indications of interest in developing weapons utilising ICAs for use in law enforcement have been enunciated by the Law Enforcement and Corrections Technology Advisory Council (LECTAC) a body composed of "*senior leaders from law enforcement, corrections, courts, forensic science and other criminal justice agencies and professional organizations… appointed by NIJ based on their records of distinguished service."* [349] According to its publications, LECTAC was a *"critical part of the National Institute of Justice's (NIJ) Research, Development, Test and Evaluation process"* and provided *"practitioner-based input on what technologies are most important and what technology gaps currently exist."* [350] LECTAC met annually to review high-priority technology needs as established by Technology Working Groups (TWGs) and to create a Top 10 list of technology needs for NIJ derived from the TWGs' high-priority list. This list was *"used by NIJ program managers to prepare technology solicitations for proposals and to provide a basic direction for technology development within the various NIJ technology portfolios."* [351]

The 2010 LECTEC Report stated that the criminal justice community needed a "*capability to inhibit metabolic functioning of individuals and groups (calmative agents) that is quick-acting, completely reversible and has no long-term physical or psychological effects"* together with "*a*

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344 It is interesting to note that the NIJ report of this meeting appeared to class "calmatives" as RCAs. It is unclear whether this was indicative of an official NIJ position on this issue.
345 National Institute of Justice, (30th April 2007) *op.cit.*
346 Weiss, D. (2007) *op.cit*, pp.42-43.
347 National Institute of Justice, NIJ Awards in FY2007, Operationalizing Calmatives — Legal Issues, Concepts and Technologies, http://www.nij.gov/funding/awards/Pages/2007.aspx#less-lethaltechnologies (accessed 11th August 2014).
348 Weiss, D. (2007) *op.cit*, p.43.
349 See for example, LECTEC Annual Report 2010, September 2010, https://www.justnet.org/pdf/LECTAC-2010-Report.pdf (accessed 11th August 2014), p.iii.
350 LECTEC Annual Report 2010 (September 2010) *op.cit.*, p.iii.
351 LECTEC Annual Report 2010 (September 2010) *op.cit.*, p.1.

method of delivery that is capable of delivering at a variety of ranges to a target of one or many." [352] The LECTEC Report further stated that the *"required response"* would be: *"Immediate immobilization fully recoverable in two to 30 minutes"* and this would entail *"immediate and full impairment of physical function with full recovery, immediate disruption of ability to sense and interpret information with full recovery and immediate full compliance."* [353] The LECTEC Report noted that a *"current project partially addressing this issue:* 2007-DE-BX-K009*"* was under way and this *"study should yield sufficient data to focus and solicit manufacturer development effort."* [354] It is not known whether and if so, how, the recommendations from LECTAC were taken forward by the NIJ.[355]

Despite a long-standing interest in research potentially related to ICA weapons development, in 2013 senior U.S. representatives explicitly stated that no attempts to develop weapons employing such chemical agents currently take place. At the Third CWC Review Conference, the U.S. Acting Under Secretary for Arms Control and International Security, Ms Rose Gottemoeller, declared that: *"the development, production, acquisition, stockpiling, or use of incapacitating chemical agents—or any other toxic chemicals—in types and quantities inconsistent with purposes not prohibited by the Chemical Weapons Convention, is clearly prohibited by Article I of the Convention."* [356]

Ms Gottemoeller highlighted concerns that *"illicit programmes could possibly be concealed under the guise of a legitimate treaty purpose, such as law enforcement"* and further warned that States Parties *"must all be vigilant to ensure that incapacitating chemical agents and other technologies do not jeopardise the twin goals of the Convention—the destruction of all chemical weapons and the prevention of the re-emergence of chemical weapons."* [357]

352 LECTEC Annual Report 2010 (September 2010) *op.cit.*, p.34.
353 LECTEC Annual Report 2010 (September 2010) *op.cit.*, p.34.
354 LECTEC Annual Report 2010 (September 2010) *op.cit.*, p.34.
355 According to the JUSTNET - the website of the National Law Enforcement and Corrections Technology Centre:*"NIJ is currently working to re-define its research, development, test and evaluation (RDT&E) process, and the role that various working and advisory groups have in that process, to ensure that the process is cost effective, sustainable, and continues to meet the needs of public safety practitioners. As such, many of the Technology Working Groups and LECTAC are currently under review and are not actively meeting at this time.[Dated 2010]"* See: https://www.justnet.org/our_centers/fact_sheets/lectac.html (accessed 11th August2014).
356 OPCW, Conference of States Parties, *United States of America: Statement by Rose E. Gottemoeller, Acting Under Secretary for Arms Control and International Security, at the Third Review Conference, Third Special Session* RC-3/NAT.45, 8th – 19th April 2013, 9th April 2013.
357 *Ibid.*

Furthermore, in a statement to the OPCW Executive Council meeting held in May 2013, the U.S. Ambassador, Dr Robert Mikulak confirmed *"very clearly and directly… that the United States is not developing, producing, stockpiling, or using incapacitating chemical agents."*[358]

On 30th July 2014 in correspondence to BNLWRP, Mr Kenneth Ward, Executive Director of the U.S. CWC National Authority noted previous statements made by U.S. officials *"on numerous occasions and in multiple fora"* that the U.S. *"is not developing, producing, stockpiling, or using incapacitating chemical agent weapons."* [359] He specifically highlighted U.S. Under Secretary of State Gottemoeller's statement to the third CWC Review Conference *"that there are real concerns 'that illicit programs could possibly be concealed under the guise of a legitimate treaty purpose, such as law enforcement'".*[360] Mr Ward also stated that *"Accordingly, the United States was disappointed the Review Conference did not achieve final report text that would have encouraged additional discussion and potential action related to these agents. The United States maintains that this issue should be addressed by the Executive Council in the future."*[361]

However, despite these statements, there has been uncertainty as to whether there was continuing interest by the U.S. armed forces in dual-use research that could potentially have applicability in the study or development of ICA weapons. On 1st October 2009, the Air Force Office of Scientific Research (AFOSR) issued an initial solicitation for a $49 million multi-project research programme entitled *"Advances in Bioscience for Airmen Performance"* (BAA-09-02-RH).[362] Under this announcement, the 711th Human Performance Wing, Human Effectiveness Directorate solicited *"white papers… for innovative science and technology projects to support advanced bioscience research."* Specifically, the Biosciences and Performance Division was seeking *"unique and innovative research concepts"* that address its four *"technical mission areas"* which included *"biobehavioral performance."* [363]

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358 OPCW, Executive Council, Seventy-Second Session, *United States of America: Statement by Ambassador Robert P. Mikulak, United States Delegation to the OPCW, at the Seventy-Second Session of the Executive Council*, EC-72/NAT.8 6th and 7th May 2013, 6th May 2013.

359 Correspondence to Dr M.Crowley, BNLWRP, from Mr K. D. Ward, Executive Director, U.S. National Authority for the Chemical Weapons Convention, Bureau of Arms Control, Verification and Compliance, U.S. Department of State, 30th July 2014.

360 *Ibid.*

361 *Ibid.*

362 Advances in Bioscience for Airmen Performance BAA-09-02-RH, Air Force Office of Scientific Research (AFOSR, Department of Defense, original grants notice posted 1st October 2009. This together with subsequent revisions , available from https://www.fbo.gov/?s=opportunity&mode=form&tab=core&id=0b237485b3d66e02ad7e4b94588069e0&_cview=0 (accessed 11th August 2014).

363 The three other *"technical mission areas"* were: Applied Biotechnology - Goal is to develop and exploit advances in biotechnology and associated nanotechnologies to enhance performance and situational awareness of the force; Vulnerability Analysis – Goal is to rapidly identify human threat conditions, and sustain/expand Airmen performance in stressful environments. It includes research in physical and physiological

Although the over-arching goal of the *"biobehavioral performance"* mission area was to *"develop bio-based methods and techniques to sustain and optimize airmen's cognitive performance"*, it included *inter alia:*

> *a) "Development of effective, reliable, and affordable alertness management, performance enhancing and emotional state modulation technologies. Includes non-medical neuroscience and biochemical pathway techniques.*
>
> *b)* ***Conversely, the chemical pathway area could include methods to degrade enemy performance and artificially overwhelm enemy cognitive capabilities."*** *[Highlighted for emphasis]"*[364]

In its original solicitation, the U.S. Air Force anticipated *"awarding 3-4 awards per year for this announcement"*[365]; to date publicly available information indicates that contracts have been awarded in 2012 and 2013 for projects apparently unrelated to ICAs.[366] The deadline for final submission of white papers for this research programme was 14th February 2014.

On 11th September 2014, following a request by BNLWRP for further information on this project, a U.S. Department of Defense (DoD) official stated that:

> *"The purpose of the program text for the bio behavioral performance technical area, including the statement, 'conversely, the chemical pathway area could include methods to degrade enemy performance and artificially overwhelm enemy cognitive capabilities,' was to be inclusive of all potential chemical pathways areas for study in order to sustain and optimize cognitive performance."*[367]
>
> *"Research related to the study of chemical pathways was contained in the bio behavioral performance technical area of the research program. However, no grant was awarded for work under this technical area. Grants were awarded for work in other technical areas, but that work does not involve ICA research. The solicitation of and granting of any work under this project is compliant with the Chemical Weapons Convention..."*[368]

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biosignatures, neuroscience, anthropometry, biomechanics, human modeling, database networking, and data mining; Counterproliferation – Goal is to improve the Air Force's ability to locate, identify, track, target, and destroy biological warfare agents (BWA) and other weapons of mass destruction (WMD), as well as anticipate and mitigate WMD effects on AF operations. Air Force Office of Scientific Research (1st October 2009) *op.cit.*

364 Air Force Office of Scientific Research (1st October 2009) *op.cit.*

365 Air Force Office of Scientific Research (1st October 2009) *op.cit.*

366 A contract was awarded on 23rd August 2012 for advanced ammonium nitrate detection prototype development (FA8650-12-C-6270) and a second on 19th June 2013 to conduct research for technology integration (FA8650-13-C-6398).

367 Correspondence to Dr M.Crowley, BNLWRP, from Ms. Cynthia O. Smith, Department of Defense Spokeswoman, the Defense Press Office, Office of the Assistant Secretary of Defense (Public Affairs), United States of America, 11th September 2014.

368 Correspondence to BNLWRP from the U.S. Defense Press Office, (11th September 2014) *op.cit.*

> *In response to your question on whether the United States conducts research related to Incapacitating Chemical Agents (ICAs) for protective purposes, DoD reiterates the response from Mr. Kenneth Ward...that the United States "is not developing, producing, stockpiling, or using incapacitating chemical agent weapons."* [369]

The clarifications by the DoD with regard to BAA-09-02-RH are to be welcomed and address an area where potential mis-perceptions could have arisen. Unfortunately, the DoD statement on potential ICA research for *"protective purposes"* was less forthcoming. Consequently, it is not currently known whether the U.S. has undertaken research in this area and if so whether and how it has been reported to the OPCW as part of its annual Article X declaration[370]; further clarification in this area would be welcome.

5. Application of the Chemical Weapons Convention to ICA research and development

Article I of the Chemical Weapons Convention prohibits the development, production, stockpiling, transfer and use of chemical weapons *"under any circumstances"*.[371]

The Convention defines chemical weapons, under Article II(1), as including: *''toxic chemicals and their precursors, except where intended for purposes not prohibited, as long as the types and quantities are consistent with such purposes.''* [372] Article II(2) defines a toxic chemical as: *"…any chemical, regardless of its origin or method of production, which, through chemical action on life processes, can cause death, temporary incapacitation or permanent harm to humans or animals."* [373]

Although the Convention includes three Annexes of Scheduled toxic chemicals specifically "*identified for the application of verification measures"*[374], the scope of the Convention is not constrained to these Schedules but is determined by Article II.(1) otherwise known as the General Purpose Criterion (GPC). Because the GPC establishes a prohibition based on intent rather than on a limited list of toxic chemical agents, it allows the Convention to accommodate and reflect developments in science; consequently, as Meselson and Perry Robinson have highlighted, *"even toxic chemicals whose existence is not yet known are covered"* by its provisions.[375]

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369 Correspondence to BNLWRP from the U.S. Defense Press Office (11th September 2014) *op.cit.*
370 See: OPCW, Chemical Weapons Convention, (1993) op.cit., Article X, particularly paragraphs 2-4.
371 OPCW, Chemical Weapons Convention (1993) op.cit., Article I.
372 OPCW, Chemical Weapons Convention (1993) op.cit., Article II(1)a.
373 OPCW, Chemical Weapons Convention (1993) op.cit., Article II(2).
374 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II.(2).
375 Meselson, M. and Perry Robinson, J. New Technologies and the Loophole, Editorial, *Chemical Weapons Convention Bulletin 23*, March 1994, Harvard Sussex Program. http://fas-www.harvard.edu/_/hsp/bulletin/cwcb23.pdf. (Accessed 5th August 2014), p.1.

Since those chemicals promoted for use as ICA weapons can *"through chemical action on life processes…cause death, temporary incapacitation or permanent harm"* to their targets, they are toxic chemicals and are covered under the scope of the Convention.[376] Such toxic chemicals would be deemed to be chemical weapons (and therefore prohibited) if they were used for purposes other than those exemptions stipulated under Article II (9) of the Convention,[377] or if their use was inconsistent with the types and quantities restriction of Article II.

The CWC does not explicitly prohibit research relating to chemical weapons (for example for protective purposes), but instead prohibits development and production of such weapons under Article I. However, where research is an intrinsic part of a weapons development programme it clearly will fall within the scope of the Article I prohibition.

There appear to be four potential scenarios where research into pharmaceutical chemicals that could be employed as ICA weapons may fall within the scope of the CWC, triggering different obligations upon CWC States Parties:

Scenario 1: State research into and development of ICA weapons intended for armed conflict

The use in armed conflict of the toxic properties of chemical agents is absolutely prohibited[378], as is their development, production, acquisition, stockpiling, retention or transfer when intended for such purposes, under Articles I and II. If States have undertaken programmes to develop ICAs and/or associated means of delivery for such purposes, they are required to halt such activities, declare any chemical weapons and chemical weapons production facilities they possess (under Article III[379]) and ensure they are verifiably destroyed (under Article I, and in accordance with Articles IV and V respectively[380]).

Scenario 2: State research into and development of ICA weapons intended for law enforcement purposes

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376 Although the CWC Schedules currently list only one ICA: BZ (Schedule 2.a.), and two of its immediate precursors, 3-Quinuclidinol and Benzilic Acid (both Schedule 2.b.), [See: OPCW, Chemical Weapons Convention (1993) *op.cit.*, Annex on Chemicals, B. Schedules of Chemicals, Schedule 2.], all toxic chemicals promoted as ICAs fall within the Convention's ambit.

377 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II(9).

378 In addition to the Chemical Weapons Convention, the use of toxic chemical in armed conflict is prohibited under the 1925 Geneva Protocol and customary international humanitarian law. For further discussion, see: : ICRC, *Toxic Chemicals As Weapons For Law Enforcement: A threat to life and international law? Synthesis paper*, September 2012; Loye, D. Potential implications for international humanitarian law, pp.40-42, in: ICRC 2010 expert meeting report (October 2010) *op.cit.;* Hampson, F. International law and the regulation of weapons, pp.231-261, in: Pearson, A.,Chevrier, M. and Wheelis, M. (eds) (2007) *op.cit.;* Coupland, R. Incapacitating biochemical weapons: risks and uncertainties, pp.225-231, in: Pearson, A.,Chevrier, M. and Wheelis, M. (eds) (2007) *op.cit.*

379 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article III (1). a-c.

380 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article I (2) and (4); Article IV and Article V.

Among the *"purposes not prohibited"* listed in Article II (9) of the Convention are: *(d) Law enforcement including domestic riot control purposes.''*[381] However, toxic chemicals can only be employed for such purposes provided their use is consistent with the *"types and quantities"* restriction of Article II. No OPCW policy making organ (PMO) has made any interpretative statements regarding application of these Articles or issued guidance as to whether toxic chemicals intended for use as ICA weapons can be employed for law enforcement purposes and if so, under what circumstances. It is therefore left to individual States Parties to interpret the scope and nature of their obligations in this area.[382] When interpreting and implementing their obligations in this area, States Parties must also consider their obligations under all relevant international law,[383] with particular attention given to international and regional human rights law as the primary area of law regulating the use of force by law enforcement officials and other agents of the State.[384]

Under Article III, States Parties are required to submit an initial declaration to the OPCW Technical Secretariat of all toxic chemicals that are kept for riot control purposes.[385] However, there are no requirements for States Parties to provide any information concerning development or possession of Non-Scheduled toxic chemicals intended for use as ICA weapons in law enforcement, provided that such activities do not breach Article I of the Convention. In its 2008 report on developments in science and technology, the SAB stated that:

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381 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II(9)d.

382 During the Third CWC Review Conference, certain States Parties i.e. Germany and Switzerland, explicitly declared that only riot control agents can be employed in their countries for law enforcement. [See: OPCW, Conference of States Parties, Germany: Statement by Ambassador Rolf Wilhelm Nikel, Commissioner of the Federal German Government for Disarmament and Arms Control, at the Third Review Conference, Third Review Conference RC-3/NAT.28, 8th – 19th April 2013, 9th April 2013; OPCW, Conference of States Parties, Switzerland: Statement by Markus Borlin, Permanent Representative of Switzerland to the OPCW, General Debate, Statement at the Third Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention, 8th April 2013]. Australia has subsequently *"unconditionally"* confirmed that it *"is not developing, producing, using or stockpiling any toxic chemicals, other than riot control agents, for law enforcement purposes and join[ed] others in calling on all States to state their position accordingly."* [See: Statement to the Eighteenth Session of The Conference of States Parties to the Chemical Weapons Convention by H.E. Mr Neil Mules, Permanent Representative of Australia to the OPCW, The Hague, 2nd December 2013].

383 Given the nature of the toxic chemicals under consideration and the proposed contexts for their use, the applicability of the 1961 Single Convention on Narcotic Drugs and the 1971 Convention on Psychotropic Substances, in addition to human rights law, should be assessed.

384 While several human rights norms may be applicable, the rights to life, to liberty and security, to freedom from torture and cruel, inhuman, or degrading treatment, and to health, together with attendant obligations on the restraint of force, appear to be the most relevant. For further discussion see: Crowley, M. The use of incapacitants in law enforcement, pp.357-381, in: *Weapons under international human rights law* (ed Casey-Maslen. S.) Cambridge University Press, 2014; Doswald-Beck, L., Assessing "incapacitating chemical agents" under human rights law, pp.39-45, in: ICRC 2012 expert meeting report (January 2013) *op.cit.*; Vandova, V., The European Court of Human Rights' Judgment in the case of Finogenov and others V. Russia, pp.46-49, in ICRC (2012) op.cit,; Hampson, F. Potential implications for human rights law, pp.53-56, in: ICRC 2010 expert meeting report (October 2010) *op.cit.*

385 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article III (6).1.e.

> *"From the standpoint of promoting transparency and building confidence there will… be advantages of considering an extension of the Convention's declaration requirements so that States Parties would have to declare all chemicals they have stockpiled for law-enforcement purposes (types, quantities, and delivery systems)."* [386]

To date, no OPCW policy making organ appears to have sought to address this issue.

Scenario 3: State research into and/or development of ICAs for protective purposes

Under Article X of the CWC, States are permitted to *"conduct research into, develop, produce, acquire, transfer or use means of protection against chemical weapons, for purposes not prohibited under this Convention"*[387] even where this involves production in appropriate quantities of potential chemical weapons agents, including ICAs.[388] Consequently, in order to increase *"transparency of national programmes related to protective purposes"*, Article X obliges each State Party to *"provide annually to the Technical Secretariat information on its programme"*.[389] In 2004, the 9th Conference of States Parties (CSP) adopted a template form for States Parties to utilise when submitting their Article X.4 declarations[390], in order to facilitate consistent implementation by a greater number of States.

In its 2008 report, the SAB stated that the *"potential risks"* to the CWC associated with advances in science and technology would *"increase significantly, should dedicated chemical weapons programmes exist and should they take advantage of new toxic chemicals."* [391] Consequently, the SAB argued that *"there is therefore good reason to call for transparency in chemical-defence programmes"* [392] and recommended that *"the Second Review Conference may wish to take this up when it addresses issues related to the annual submission by States Parties of information on their national protective programmes."*[393] As of 31st December 2012, 101 States Parties had submitted

386 OPCW, Conference of the States Parties, *SAB Report, Second Review Conference* RC-2/DG.1 (28th February 2008) *op.cit.*, paragraph 3.14.
387 OPCW, Chemical Weapons Convention (1993) *op.cit.*,Article X, paragraph 2.
388 See: Perry Robinson, J.,Incapacitating chemical agents in context: an historical overview of States' policy in: ICRC 2012 expert meeting report (January 2013) *op.cit.*, p.94.
389 OPCW, Chemical Weapons Convention (1993) *op.cit.*,Article X, paragraph 4.
390 OPCW, Conference of the States Parties, Ninth Session C-9/DEC.10, 29th November – 2nd December 2004 30th November 2004, Decision, Submission of information regarding national programmes related to protective purposes pursuant to Article X, Paragraph 4 of the Convention.
391 OPCW, Conference of the States Parties, *SAB Report, Second Review Conference* RC-2/DG.1 (28th February 2008) *op.cit.*, paragraph 3.14.
392 OPCW, Conference of the States Parties, *SAB Report, Second Review Conference* RC-2/DG.1 (28th February 2008) *op.cit.*, paragraph 3.14.
393 OPCW, Conference of the States Parties, *SAB Report, Second Review Conference* RC-2/DG.1 (28th February 2008) *op.cit.*, paragraph 3.7.

information on their national programmes for protective purposes.[394] Although a small number of States have made their annual Article X declarations public[395], most have not, and information provided by the OPCW on these submissions is very limited. Consequently, it is not possible to determine whether the vast majority of States Parties have provided any information to the OPCW on research for *"protective purposes"* related to ICAs, and if so whether such information is accurate and complete.

Scenario 4: research into toxic chemicals and/or delivery mechanisms purportedly for medical or other non-prohibited purposes, but which can be employed as ICA weapons

From a combined reading of Article I and Article II, development, production, acquisition, stockpiling, retention or transfer of toxic chemicals (including those that could be employed as ICAs) for *"Industrial, agricultural, research, medical, pharmaceutical or other peaceful purposes"* would be considered as *"Purposes Not Prohibited"* under the CWC[396], provided such activities conformed to the *"types and quantities"* restriction. [397] All States Parties are, however, required under Article VII to *"adopt the necessary measures to implement* [their] *obligations under this Convention"* and shall *"prohibit natural and legal persons anywhere…under* [their] *jurisdiction… from undertaking any activity prohibited to a State Party under this Convention, including enacting penal legislation with respect to such activity"* [398] Consequently, States Parties need to adopt and enforce the appropriate national implementation measures to ensure that no research and development activities related to toxic chemicals, ostensibly for peaceful purposes, are being utilised for activities contrary to the object and purposes of the CWC or in violation of international law, such as development of ICA weapons intended for armed conflict or human rights abuses.

6. SUMMARY FINDINGS AND CONCLUSIONS

The case studies, detailed in Section 4 of this report, describe a variety of different scenarios in which research potentially applicable to ICA weapons has reportedly occurred, or where such weapons have reportedly been developed or used, in the following countries:

China: ICA weapons employing an unknown anaesthetic agent for use against individuals have been developed and marketed by Chinese companies at international arms fairs held in China, and in 2012 were reportedly held by the Chinese People's Liberation Army. China has provided no public information regarding its stockpiles of these weapons nor the specific purposes of their

394 OPCW, *Status of Implementation of Article X of the Chemical Weapons Convention as at 31st December 2012,* EC-72/DG.1, 25th March 2013.
395 See for example U.K. country case study, section 4.2.8. of this report.
396 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II(9)a.
397 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article II(1)a.
398 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article VII (1).a.

intended employment. To date, China has made no statement clarifying whether any Chinese entity has conducted or is conducting research activities related to the development of ICA weapons targeting groups of individuals.

Czech Republic: From 2005-2007, Czech scientists published papers describing their investigations over several years relating to a range of pharmaceutical chemicals including various opioids, ketamine, medetomidine and midazolam, specifically highlighting their potential utility as, in their own words, *"pharmacological non-lethal weapons"*. Research into such chemicals continued after 2007, but additional papers contained no explicit reference to their potential application as so-called *"pharmacological non-lethal weapons"*. The Czech Republic CWC National Authority subsequently investigated Czech research activities and in 2014 stated that *"There was no connection [between] the research [and] creation of any sort of weapons or devices which could be used for military or police purposes."* With regard to the Czech *"pharmacological non-lethal weapons"* papers, the National Authority stated that *"research programmes had justifiable medical goals, but their reporting in public media exceeded actual results of the research thus creating a false impression of possible development of some sort of chemical weapons."*

India: Scientists at the Defence Research & Development Organisation (DRDO) have conducted work related to the synthesis, aersolisation and bio-efficacy of fentanyl and its analogues, as described in papers from 2005 till 2013. In 2014, the Indian CWC National Authority gave *"categorical and unambiguous clarifications"* that India has no stockpile of ICAs, is not involved in the weaponisation of ICAs and that *"research on fentanyl is being carried out in India only for the purpose of protection."* It is not known whether such activities have been reported to the OPCW as part of India's annual (Article X) declaration of national programmes related to *"protective purposes"*.

Iran: Research scientists at Imam Hossein University (IHU) have explored the structural-activity relationships of fentanyl and its analogues and have attempted to generate stable long lasting aerosols of medetomidine and other potential ICAs; their work detailed in papers from 2007 till 2013. IHU is an academic institution run along military lines and controlled by the Iranian Revolutionary Guard. In 2014, the Iranian CWC National Authority stated this *"academic research is financed by [the] ministry of science and technology* and is *"solely [for] scientific purposes"*.

Israel: In the 1950s, Israel reportedly initiated a chemical weapons research and development programme; the current nature of such activities is unknown. Previous work was reportedly based at the Israel Institute for Biological Research (IIBR), and included research on potential ICAs. Israeli

security services have employed an ICA weapon as an attempted assassination tool in at least one occasion, in 1997. There is insufficient publicly available information to determine whether any Israeli entity is currently undertaking research into weapons employing ICAs, or whether Israel holds stockpiles of such weapons. There is limited information available indicating that the IIBR may be conducting work in potentially relevant dual-use fields, although the details of the specific IIBR research projects are not available.

Russian Federation: There are indications that the Soviet Union and subsequently the Russian Federation conducted research into ICA weapons prior to and following the coming into force of the CWC. In 2002, Russian Security forces employed an ICA weapon to free 900 hostages held by Chechen fighters. Although the hostages were freed, 125 hostages died due to the effects of the ICA and an unknown number of former hostages suffer long term injury. Russian researchers have continued work of potential application to ICA weapons. This has included computer modelling of so-called "calmative" gas flows in enclosed spaces, as detailed in a 2009 presentation, and research relating to opiate receptors (OR) and their interaction with OR ligands, detailed in papers from 2005 till 2012.

Syria: Since the 1970s, Syria reportedly acquired and/or developed and stockpiled a range of chemical weapons and agent precursors – this stockpile has now been declared and is being destroyed under OPCW supervision. From early 2012, there have been repeated but, to date, unconfirmed allegations that the Syrian Government armed forces employed ICA weapons during the ongoing conflict with armed opposition forces.

United Kingdom (U.K.): The U.K. Government has released documents detailing the country's previous attempts to develop ICA weapons for military purposes from 1959 to 1972. There is no evidence of a subsequent military ICA weapons development programme. There are indications of ICA research continuing into the 1980s, although the nature and purpose of such activities are not known. In the early-to-mid-2000s, the U.K. Government assessed the feasibility of introducing ICA weapons for certain law enforcement purposes, but subsequently rejected this option. In 2013, the U.K. "*unequivocally*" declared that it "*neither holds or is developing any ICAs for law enforcement*". U.K. researchers based at Porton Down have conducted research into ICAs for "*protective purposes*" and the U.K. has provided some information on these activities to the OPCW in its annual Article X declarations, and also to the U.K. Parliament.

United States (U.S.): The U.S. has a long history of research into ICA weapons dating back to the 1950s. Approximately 60,000 kilograms of BZ were manufactured and the agent was weaponised in

two munition types that entered the U.S. arsenal in 1964. There are no confirmed reports that ICA weapons were ever employed in armed conflict by the U.S., and all stockpiles were subsequently destroyed in the late 1980s and 1990s. Research into ICA weapons continued for both military and law enforcement purposes, even after the coming into force of the CWC, although there is no evidence of completed development or production of ICA weapons. In 2013, the U.S. declared *"very clearly and directly"* that it *"is not developing, producing, stockpiling, or using incapacitating chemical agents"*. It is not currently known whether the U.S. undertakes dual-use research related to ICAs for *"protective purposes"*, and if so how and whether this is reported to the OPCW in its Article X declarations.

Analysis of open source information concerning both historical ICA weapons development programmes and contemporary research potentially applicable to the study or development of ICA weapons, indicates that such activities have been undertaken either by scientists operating within State research establishments principally linked to defence, security or law enforcement bodies, or by scientists working in civilian research institutions who are funded or controlled by such bodies. There have been isolated reports of small-scale use of "sleeping gas" by criminals in France, Italy and Spain.[399] Currently there is no evidence of concerted attempts by armed non-State actors, such as terrorist groups, to conduct research and development of ICA weapons.

Publicly accessible information clearly indicates that China, Israel and the Russian Federation have acquired or developed ICA weapons and that such weapons are either in the possession or have been used by law enforcement or security services of those countries, since the coming into force of the CWC in 1997. The situation in other States is less certain: although evidence of potentially relevant dual-use research has been obtained in a number of other countries, the full nature and purpose of such research in certain States is often unclear as are the intended applications to which it will be put.

A number of factors have contributed to such uncertainty including the inherent dual or rather multiple applicability of research in these areas; the difficulty with establishing the true intent of the individual researchers or the research institutions; and the current contested nature of the application of the CWC in these areas. Such uncertainties are exacerbated by the limited information released publicly by States concerning research programmes funded or controlled by defence, security or law enforcement bodies: with the consequent danger that public reporting on

399 See for example: Hooper, J. 'Sleeping gas' thieves target super-rich at Italian billionaires' resort, *the Guardian*, 30th August 2011, http://www.theguardian.com/world/2011/aug/30/italy-thieves-sleeping-gas-sardinia (accessed 15th September 2014); BBC world news, Italian thieves use sleeping gas on Costa Smeralda, 31st August 2011, http://www.bbc.co.uk/news/world-europe-14734741 (accessed 15th September 2014).

these issues will be incomplete or inaccurate, and even that disinformation will be disseminated and accepted. Similarly, since there are currently no effective OPCW reporting or transparency mechanisms covering ICA weapons research and development for law enforcement purposes it is unlikely that any CWC States Parties conducting such activities currently provide information to the Organisation in this area. In such an information vacuum, there is a danger that mis-perceptions into entirely benign research may arise, or conversely that ICA weapons development programmes intended for law enforcement or military purposes may operate without the knowledge of the international community.

Research into ICAs for protective purposes appears to have taken place in certain States, as permitted under the CWC. Clearly such work requires some level of secrecy with regard to the threats that are of concern and the responsive measures that are being undertaken. Yet, without some assurance that the work is only directed at defensive requirements such as identification of agents for prophylaxis and treatment, and development of protective measures, there is an obvious danger that mis-perceptions about the nature and purpose of such activities could arise.

The potential for false perceptions about current State activities and misunderstandings about State motivations behind dual-use research, are exacerbated by the inability of the OPCW policy making organs to issue clear guidance as to whether ICA weapons can be employed for law enforcement purposes and if so, under what circumstances. This policy lacuna has left individual States Parties to interpret the scope and nature of their obligations in this area. It appears that to date State practice, as embodied in ICA weapons research and development activities, has not solidified around either a "permissive" or "restrictive" interpretation. However, in the last few years there are indications of a growing movement towards a more "restrictive" approach with certain States Parties for the first time publicly clarifying existing "restrictive" positions or introducing such positions where there had previously been silence, ambiguity or a "permissive" approach.[400] However, until this issue is addressed by the CWC States Parties collectively, the potential for State practice to establish a "permissive" interpretation remains.

A range of medical and scientific bodies, together with human rights, international humanitarian law and arms control organisations have highlighted the potential consequences of this

400 This process has been promoted, in particular, by the ICRC which in February 2013 issued a call for all States to *"Enact national legislation, if they have not already done so, that limits the use of toxic chemicals as weapons for law enforcement purposes to riot control agents only and that prohibits the research, development, production, stockpiling and use of any toxic chemical as a weapon for law enforcement that does not fit the definition of a riot control agent specified in the Chemical Weapons Convention"* [See: ICRC, ICRC position on the use of toxic chemicals as weapons for law enforcement, 6th February 2013, https://www.icrc.org/eng/resources/documents/legal-fact-sheet/2013-02-06-toxic-chemicals-weapons-law-enforcement.htm (accessed 15th September 2014).

"permissive" interpretation: with first and foremost the immediate unacceptable risk that the use of such weapons will result in the death or serious injury of a proportion of the targeted population. Furthermore, the development and introduction of ICA weapons, even if initially intended only for certain discrete law enforcement purposes such as responding to hostage-taking, threatens to create a "slippery slope" with the danger that such weapons once introduced will consequently be used for an increasingly broad range of law enforcement purposes and by an ever growing range of actors including military personnel. The consequent "creeping legitimization" of such weapons could in turn result in both horizontal and vertical proliferation dramatically increasing the danger of their subsequent employment in armed conflicts and large scale human rights abuses by State or non-State actors. The current study indicates that there may be several different entry points upon this "slippery slope", with dual-use research that could potentially be applied to ICA weapons being conducted in a variety of institutional environments and for a range of (stated or unstated) purposes.

Because the possession and utilisation of ICA weapons currently appears to be restricted to a relatively small number of States, there is still time for the international community to act. There is now a window of opportunity for the OPCW to take a precautionary and preventative approach: to effectively monitor developments in relevant dual-use research and actively address the attempted development, acquisition, stockpiling and potential employment of these agents as weapons. If the OPCW does not act decisively in the near future, there is a danger that an ever growing number of States will seek to harness advances in relevant scientific disciplines in ICA weapons development programmes, or may be perceived – rightly or wrongly – of doing so. This, in turn, may convince further States to conduct their own ICA weapons research and development programmes or potentially explore an even broader range of chemical agents, with the danger of a consequent spiral of actions and reactions that could weaken or eventually erode away the prohibition of chemical weapons.

7. RECOMMENDATIONS

7.1. Recommendations for CWC States Parties

CWC States Parties both individually and collectively should consider the following activities and processes for regulating research potentially applicable to the development of ICA weapons:

(1) Initiate a mechanism within the OPCW to discuss the employment of ICA weapons in law enforcement

At both the Second and Third CWC Review Conferences, proposals were submitted to establish a mechanism within the OPCW to facilitate discussion amongst States Parties regarding ICAs, their

employment in law enforcement, and possible transparency measures for such agents.[401] Given the widespread support amongst States Parties for action in this area, a State Party or group of like-minded States Parties should once again present proposals at a suitable policy making organ (i.e. the forthcoming 19th CSP or a future Executive Council meeting) to establish such a mechanism. Under such proposals an open ended working group or some other formal mechanism could be established to make recommendations on these issues for consideration by the Executive Council or the Conference of States Parties. Such formal processes would be open to all States Parties that wished to participate and would reach their conclusions by consensus.

2) Affirm current national practice is to restrict use of toxic chemicals for law enforcement to riot control agents; where such restriction is not existing policy States should introduce national moratoria on the development, acquisition, stockpiling, transfer and use of ICA weapons intended for law enforcement purposes. States should also clearly reaffirm the existing prohibition on the use of toxic properties of all chemicals in armed conflict.

To date, Australia[402], Germany[403] and Switzerland[404] have formally declared that the only toxic chemicals that can be employed for law enforcement purposes in their countries are riot control agents. Where appropriate, and in order to build confidence and avoid mis-perceptions, States Parties should give similar undertakings, publicly and on the record, for example through National Statements to the forthcoming CSP.

Where such restriction is not existing policy, States Parties should consider introducing unilateral national moratoria halting the initiation or continuation of the development, acquisition, stockpiling, transfer and use of ICA weapons intended for law enforcement. Such moratoria would not be designed to restrict development, acquisition, stockpiling, transfer or use of chemical agents legitimately employed for medical, veterinary or other peaceful purposes, but solely those intended for employment as ICA weapons in law enforcement. In addition, if requisite agreement for this were forthcoming, a group of like-minded States Parties could introduce a moratorium on such activities at the pluri-lateral level. Such moratoria should remain in place until CWC States Parties collectively determine whether or not the use of ICA weapons in law enforcement is permitted under the Convention.

States Parties should also publicly clearly reaffirm that under the CWC, the use in armed conflict of the toxic properties of all chemicals (including those promoted as ICA weapons) is prohibited, as is

401 See: Conference of the States Parties, *Switzerland: Riot Control and Incapacitating Agents Under the Chemical Weapons Convention*, OPCW document RC-2/NAT.12, 9 April 2008, p. 5; Draft text on toxic chemicals employed for law enforcement proposed for inclusion in the Review Conference Final Report, 19th April 2013.

402 OPCW, Conference of States Parties, *Australia: National Statement* (2nd December 2013*) op.cit.*

403 OPCW, Conference of States Parties, *Germany: National Statement* (9th April 2013*) op.cit.*

404 OPCW, Conference of States Parties, *Switzerland: National Statement* (8th April 2013*) op.cit.*

their development, production, acquisition, stockpiling, retention or transfer when intended for such purposes.

(3) Ensure comprehensive interpretation, effective implementation and wide-spread promulgation of the CWC including its General Purpose Criterion

The States Parties at the Third Review Conference "*reaffirmed the continued relevance of the definitions contained in Article II of the Convention, which ensure the comprehensive nature of the prohibition of chemical weapons under the Convention."* [405] The Review Conference considered that the terms "*chemical weapons"* and "*chemical weapons production facility"*, adequately covered "*the impact of developments in science and technology on the Convention's prohibitions"* and provided for the application of these prohibitions to "*any toxic chemical, except where such a chemical is intended for purposes not prohibited by the Convention, and as long as the types and quantities involved are consistent with such purposes."*[406]

States Parties should now ensure that this reaffirmation of the wide-ranging scope of the CWC is translated into comprehensive and effective implementation of the Convention at the national level. Consequently, States should ensure that all relevant research activities potentially related to development of ICA weapons are in conformity with the Convention. In addition, States should carry out necessary promulgation activities to ensure that all those engaged in such research, be they working in defence, law enforcement, industry, academia or other sectors; are aware of their obligations under the Convention.

To facilitate effective implementation of the General Purpose Criterion, the OPCW should consider establishing a consultative process to develop guidelines on how the "*types and quantities"* principle should be applied in practice. Development of such guidelines should be informed by technical input from the Technical Secretariat and the SAB, and be open to contributions from all State Parties. Such guidelines would be applicable to the employment of all toxic chemicals, including ICAs with weapons utility.

(4)Fulfil existing reporting obligations and introduce additional transparency mechanisms

(i) As an immediate first step, it would be beneficial if those States where activities apparently related to the development or utilisation of ICA weapons have been reported, provide clarification as to the nature and purpose of such activities through an appropriate mechanism. It would build confidence and help to remove misperceptions if such clarification were public and on the record, for example through National Statements to the forthcoming 19th Conference of States Parties.

405 OPCW, *Report of the Third Review Conference, Part B,*(19th April 2013) *op.cit.*, paragraph 9.141.
406 *Ibid.*

(ii) States conducting research into ICAs for *"protective purposes"* should report such activities to the Technical Secretariat in their annual declarations, as required under Article X(4) of the Convention. Such declarations should provide sufficient information for the States Parties and the OPCW as a whole, to make informed assessments of the purpose and nature of relevant research and associated activities. To build confidence and help to remove misperceptions, the OPCW should review the information currently provided by Member States in their declarations and consider revision of the current Article X(4) declaration template form to elicit further information specifically with regard to research related to non-Scheduled agents. Furthermore, and where appropriate, individual States should consider making their annual Article X declarations publicly available. In addition, to further mitigate misperceptions and increase confidence at the national level, States Parties should introduce appropriate independent national oversight systems reporting regularly to the legislature,[407]

(iii) The permissibility of developing, stockpiling, transferring and using chemical agents other than RCAs for law enforcement purposes (such as ICAs) is currently contested and would remain so until States Parties establish their status under the Convention. However as an interim confidence building measure, a State Party or group of States Parties could bring forward proposals for the OPCW to develop reporting and transparency mechanisms for toxic chemicals utilised in law enforcement. A suitable mechanism, such as an open ended working group, could develop recommendations for extending the existing RCA reporting and transparency obligations to cover all toxic chemicals held by States Parties for law enforcement purposes. The working group could also consider whether existing information requirements are adequate or should be expanded to include, for example:

(a) Name/CAS number of each type of toxic chemical and quantities held;

(b) Nature and quantities of the associated munitions, means of delivery or dispersal;

(c) Authorities holding stockpiles and permitted to use toxic chemicals and associated munitions, means of delivery or dispersal;

(d) Nature of intended use e.g. riot control, hostage situation;

(e) Decisions by States Parties not to introduce certain toxic chemicals and delivery mechanisms (e.g. ICA weapons) for law enforcement purposes and their rationale.

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407 For discussion of such issues in the related area of biodefence, see: Bansak, K.C. Biodefense and Transparency: The Dual-Use Dilemma, *Nonprolioferation Review*, volume 18, issue 2, 2011, pp.349-368.

Such reporting and transparency mechanisms could be introduced as voluntary confidence-building measures (CBMs) – similar to the CBMs utilised by States Parties to the Biological Weapons Convention[408]. In addition, individual States Parties should now consider submitting such expanded reports on toxic chemicals held for law enforcement purposes, on a unilateral basis to the Technical Secretariat. If appropriate, individual States Parties could also publicise the information contained in their expanded national reports more widely.

(5) Utilise existing CWC consultation, investigation and fact-finding mechanisms

A variety of existing OPCW mechanisms can be used by States Parties when activities of potential concern come to their attention, such as reports of the development, acquisition or use of ICA weapons by law enforcement, security or military forces, particularly if human rights violations or breaches of international humanitarian law have been alleged. In such cases, clarification could be sought concerning: the nature and quantities of ICAs and associated means of delivery developed or acquired, and stockpiled, and the entities holding such agents and devices; the anticipated uses to which they might be put and/or full details of any instances of such employment; the political and legal controls on development, acquisition, stockpiling, deployment and use. If the relevant States agree, in order to dispel misperceptions, the results of such consultations should be made known to all States Parties, and, if appropriate, to the wider public. If bilateral consultations with the relevant States do not prove fruitful, concerned States Parties should consider a formal request under Article IX of the CWC.

7.2. Recommendations for the Director General and the Technical Secretariat

The Director General and the Technical Secretariat, in consultation with the Scientific Advisory Board (SAB) where appropriate, should:

(1) Develop appropriate verification mechanisms applicable to ICA weapons

In their Report on developments in science and technology, prepared for the Third Review Conference, the Scientific Advisory Board recommended that the Secretariat start "*preparations for verification activities, relevant to incapacitating chemicals, that could be required in an investigation of alleged use (IAU)"*[409]. In his formal "Response" to the SAB Report, the Director

408 For the latest versions of relevant CBM forms see: *United Nations, Seventh Review Conference of the States Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction,* Geneva, 5–22 December 2011, *Final Document of the Seventh Review Conference*, BWC/CONF.VII/7, 13th January 2012.

409 As detailed in: OPCW, *Conference of the States Parties, SAB Report,* RC-3/DG.1, Third Review Conference (29th October 2012) *op.cit.*, paragraph 13.

General specifically committed the Secretariat to *"pursue efforts to enhance its chemical-analysis capabilities"* and to *"work with designated laboratories on this issue."*[410]

On 5th September 2014, a *"Note by the Director General"*[411] stated that *"enhancement of the OPCW's laboratory chemical-analysis capabilities is ongoing in the context of the broader on-site and off-site sampling and analysis, which could involve any toxic chemical"*[412]. However with regard to ICAs, *"no specific verification preparations are being pursued by the TS [Technical Secretariat] with designated laboratories in this particular context."*[413]

It is unclear why no verification preparations specifically related to an investigation of alleged use of ICAs have taken place, to date. Since such activities come under the responsibility and competency of the Director General and the Technical Secretariat, such preparations should be initiated as soon as is feasible.[414] In addition to developing analytical methods and procedures, the Technical Secretariat should engage in associated activities such as training courses for inspectors to enable them to address ICA weapons in investigations of alleged use.

(2) Review application of OPCW assistance and protection measures in cases of use or threatened use of ICA weapons

Under Article X of the Convention, each State Party has the right to: *"request and…to receive assistance and protection against the use or threat of use of chemical weapons if it considers that: (a) Chemical weapons have been used against it;… (c) It is threatened by actions or activities of any State that are prohibited for States Parties by Article I."*[415]

The Technical Secretariat should conduct a review of the OPCW assistance and protection programme and associated mechanisms established under Article X, to take account of the possibility that ICA weapons might be employed against a CWC State Party in an armed conflict or other situation (e.g. by armed non-State actors such as terrorist groups), so as to ensure that protection and assistance provided through the OPCW can deal with the consequences of such uses.

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410 OPCW, Conference of the States Parties, Note by the Director-General, *Response to the Report of the Scientific Advisory Board on Developments in Science and Technology for the Third Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention, Third Review Conference* RC-3/DG.2, 8th – 19th April 2013 31st January 2013, paragraph 15.

411 OPCW, Executive Council, Seventy-Seventh Session, Note by the Director General, *Status of the follow-up to the recommendations on science and technology made to the Third Review Conference*, EC-77/DG.11, 5th September 2014.

412 OPCW, Note by the Director General (5th September 2014) *op.cit.*, p.9.

413 OPCW, Note by the Director *General* (5th September 2014) *op.cit.*, p.9.

414 Some related activities may require further consultation with and/or agreement by relevant policy making organs. For example, the inclusion of new data on non-scheduled chemicals to the OPCW Central Analytical Database (OCAD) must first be submitted to the OPCW Validation Group and following their recommendation, submitted by the Director General to the Executive Council for their consideration and approval.

415 OPCW, Chemical Weapons Convention (1993) *op.cit.*, Article X(8).

(3) Monitor developments in science and technology applicable to development of ICA weapons, and bring activities of concern to the attention of States Parties

The Director General, in his "Response" to the SAB report on developments in science and technology, informed the Third Review Conference that the *"Secretariat will continue to monitor developments relating to unscheduled and novel toxic chemicals and will explore ways in which to augment its technical capabilities in this area."*[416]He further informed the Conference that the Secretariat "*will seek advice from the SAB on the feasibility of establishing a systemic approach to tracking and evaluating advances in science and technology, given the pace at which these advances are occurring."* [417] Subsequently, in his Note to the October 2013 Executive Council, the Director General highlighted the potential utility of employing "*technology monitoring and horizon scanning (a technique for detecting early signs of potentially important advances)."* [418]

Given the long-standing and widespread concern voiced by scientific and arms control organisations, the SAB and a number of State Parties that certain advances in science and technology may be employed for the development of ICA weapons, it would be appropriate for such technologies to be included within the scope of the Secretariat's monitoring mechanisms. Furthermore, it would be beneficial if the OPCW established suitable mechanisms allowing the Technical Secretariat to bring relevant concerns to the attention of the States Parties and appropriate OPCW organs.

(4) Conduct a review of the existing legal constraints upon the use of ICA weapons in law enforcement

The legality of the potential employment of a toxic chemical for law enforcement purposes is clearly constrained by the CWC, in particular the General Purpose Criterion and Article II.(9). Furthermore, CWC States Parties must give appropriate consideration to their obligations under **all** relevant international law, specifically international and regional human rights law, and determine how such direct obligations inform the interpretation and implementation of their obligations under the CWC.[419] In order to facilitate full and effective implementation of the CWC in this area by States Parties, the Director General should institute a review by the Office of the Legal Advisor

416 OPCW, Conference of the States Parties, Note by the Director-General, *Response to the SAB Report* (31st January 2013) *op.cit.*, paragraph 9.

417 OPCW, Conference of the States *Parties*, Note by the Director-General, *Response to the SAB Report* (31st January 2013) *op.cit.*, paragraph 29.

418 OPCW, *Note by the Director General*, EC-74/DG.1 (24th July 2013) *op.cit.*, paragraph 5.

419 Given the nature of the toxic chemicals under consideration and the proposed contexts for their use, the applicability of the Single Convention on Narcotic Drugs and the Convention on Psychotropic Substances, in addition to human rights law, should be assessed. Other instruments, notably the Biological and Toxin Weapons Convention may also be applicable if a wider range of ICAs – such as bioregulators and toxins (including peptides) – is under consideration. For further discussion see: Crowley, M. Potential implications for disarmament and other areas of international law, pp. 42–53, in: ICRC 2010 expert meeting report (October 2010) *op.cit.;* ICRC, *Synthesis paper, (*September 2012) *op.cit*.

(OLA), of the existing legal constraints under relevant international law, upon the use of ICA weapons in law enforcement, and determine their bearing upon the implementation of the CWC. The OLA should report its findings to a suitable policy making organ of the OPCW.

7.3. Recommendations for civil society medical, scientific and academic communities

A range of respected national and international non-governmental scientific organisations has provided the OPCW and its Member States with well-documented independent research and analysis detailing relevant scientific and technological advances that could be employed in the development of ICA weapons. Given the current discourse within the OPCW on ICA weapons, it is important that the non-governmental medical and scientific communities continue to be actively engaged on this issue, and specifically should:

(1) Monitor developments in science and technology related to ICAs and associated means of delivery and highlight attempts to harness such developments in weapons programmes.

Building on previous work, independent medical and scientific bodies should engage in technology monitoring, and science and technology horizon-scanning so as identify technologies and activities of potential concern, specifically highlighting existing research and development of ICAs and associated means of delivery conducted by State entities or other actors; and predict likely research trajectories in relevant scientific disciplines and related technologies, highlighting potential application for weapons development programmes.

(2) Engage with the OPCW

Independent medical and scientific bodies should continue to constructively engage with the relevant policy making organs, subsidiary bodies of the OPCW and individual States Parties to highlight existing limitations in the CWC and attendant control regime with regard to ICAs and associated means of delivery, and to develop and promote possible science-informed policy responses.

(3) Conduct education and awareness-raising amongst the medical, chemical and life science communities

National and international professional medical and scientific associations should explore activities to nurture a culture of responsibility amongst the greater medical and scientific communities, highlighting the potential threats arising from the mis-application of dual-use technologies, including those readily employed in development of ICA weapons, and the consequent requirement for appropriate oversight of such research. Medical, chemical and life scientists should explore opportunities to highlight concerns regarding ICA weapons through existing initiatives to develop

and promote professional oaths, codes[420] and pledges, and the parallel processes of education and awareness-raising amongst the life science, chemical[421] and biomedical communities.

420 See for example, the project undertaken by the International Union of Pure and Applied Chemistry (IUPAC) and its Committee on Chemical Research Applied to World Needs (CHEMRAWN) to develop recommendations for Codes of Conduct for chemists that might be promulgated by IUPAC and its national adhering authorities. The project was completed in November 2011 and although a formal IUPAC code of conduct has not been established to date, guiding principles for a code were developed and promoted. [Details of the project are available from IUPAC website at http://www.iupac.org/nc/home/projects/project-db/project-details.html?tx_wfqbe_pi1%5Bproject_nr%5D=2007-022-2-020 (accessed 17th September 2014)].

421 See for example opportunities for possible engagement through appropriate OPCW processes and events, such as the education and outreach meeting: *"Education for peace: new pathways for securing chemical disarmament"* held at the OPCW headquarters on 22nd-23rd September 2014. See also possible engagement through IUPAC, following on from its project established in 2005 to *develop "Educational material for raising awareness of the Chemical Weapons Convention and the multiple uses of chemicals"*. [Details of the project are available from IUPAC website at http://www.iupac.org/nc/home/projects/project-db/project-details.html?tx_wfqbe_pi1%5bproject_nr%5d=2005-029-1-050 (accessed 17th September 2014)].