

A REVIEW OF THE QUESTION OF WEAPONS OF MASS DESTRUCTION (WMD) TERRORISM

MILTON LEITENBERG, Spring-Summer 2018

Between the years 1990 and 1995 the Japanese organization, Aum Shinrikyo, produced the chemical warfare agent sarin and unsuccessfully attempted to acquire biological agents. The leader of the organization had extremely grandiose notions of what he would do with these products: bring about a war between the United States and Japan, and topple the Japanese government. This personal vision of an Armageddon fortunately resulted in no more than the deaths of a dozen innocent Japanese citizens when a hastily produced quantity of sarin was released in a Tokyo subway car.

Six years after mid-1995, in October and November 2001, the so-called “Amerithrax” events in the United States took place. In this instance an extremely highly trained researcher in the premier biodefence facility in the U.S. prepared a dry powder flask of bacillus Anthracis and sent small quantities of the material in letters to several members of the US Congress and to media outlets.

The combination of these two events had dramatic consequences in the United States, raising the fear of “WMD terrorism” through the use of chemical, biological, radiological or nuclear weapons: C, B, R, and N. Several senior public figures and political scientists prophesized that there would be a “mass casualty event” within five or ten years brought about by terrorist use of one of these weapons. (Most notoriously, Graham Allison, and

Republican Senator Richard Lugar and Gary Ackerman released opinion surveys of the expectations of supposedly “informed” persons.)

Roughly 25 years have now passed since the Aum Shinrikyo was active, which affords analysts the opportunity to look back and see what has taken place and what has not, and ask what the current threat potential is for terrorists or other non-state actors (NSA) is to use CBRN weapons.

The following pages are written in the form of an outline, and presume some familiarity of the subject matter by the reader. Much background information is therefore omitted, and an attempt will be made in different places in the pages that follow to present relevant information about all four of the WMD systems : C, B, R & N.

More detailed information appears on the following pages, and these first comments provide an introductory overview.

The current threat potential is very low for all four.

The situation as regards Biological weapons in 2018

1. National programs: since 2005-2006, the US government’s intelligence estimate is down to perhaps six countries.

2. Leakage of personnel or materials from current or past programs to terrorist groups or non-state actors :

- None from the USSR/Russia, Israel, Iran, or China.
(The national BW programs in the above named countries may all still be operational)**

- **None from Iraq and South Africa, two BW programs which were terminated in different ways and for different reasons, and no longer exist**

There were however two significant transfers in the area of chemical weapons from Russia to Syria. On two occasions between 1992 and 1994 General Anatoly Kuntsevich, a senior CBW official in the Yeltsin administration arranged the transfer of large quantities of chemical intermediates required for the production of sarin to the Syrian government agency, the Scientific Studies and Research Center, CERS. The Syrian agency was responsible for research, development and production of Syrian WMD, primarily chemical weapons. It is unknown whether Kuntsevich also passed along information to assist Syria's CW production technology, a subject about which he was very knowledgeable, but it would seem plausible that he did.

In addition in early 2018 it became known that Leonid Rink, one of the very small group of organophosphate chemists in the former USSR who produced the advanced nerve agents in the "Novichok" family, had passed a vial of one of these agents which he illegally possessed to a criminal gang which used it for the purposes of assassinating a businessman. Rink was prosecuted and brought to trial, and the trial record is publicly available.

3. One can now see in hindsight that the exercises carried out by U. S. government agencies between March 1998 and April 2005 (TOP Off I, II, III etc) based on theoretical

dispersals of aerosolized smallpox/variola and aerosolized plague, or by evangelical private “BW threat” organizations (“Dark Winter and Atlantic Storm) ranged from very highly exaggerated to hysterical. Two books on the threat assessment for biological weapon use made that argument at the time [[ASSESSING THE BIOLOGICAL WEAPONS AND BIOTERRORISM THREAT](#), M. Leitenberg, 2005 [assessing bw threat.pdf](#) , and [THE PROBLEM OF BIOLOGICAL WEAPONS](#), M. Leitenberg, 2004]

The same holds for the scenarios proposed in 2003 for the Department of Homeland Security (DHS) by Richard Danzig and adopted as “Planning Scenarios,” of multi-city “follow on” attacks using aerosolized anthrax, plague and smallpox.

4. Similarly, the Biological Threat Risk Assessments (BTRA) mandated by HSPD-10 and done by Battelle, and the Material Threat Assessments done by the LLNL and mandated by the Bio Shield Act were not really “Threat Assessments.” They modelled the dispersion of various select agents (anthracis, tularensis, etc.) varying multiple parameters (wind speed, temperature, humidity, etc. etc.) and produced millions of iterations. However all these “assessments” presumed a high-quality product, with zero discussion of what party might have been able to make or obtain such a product, or would be able to disseminate it within the U.S over a major urban center in the manner that the model required. In assessing how the terrorist or Non State Actor WMD threat has evolved over the past 25 years there is one outstanding exception, and that is the US

“Amerithrax” case referred to earlier. Few public figures or analysts include that event when discussing “terrorists” or “NSA’s”. More will be said about the case later, as it is extremely important to the question of what to anticipate, at least in the near future

Assorted reported events that purportedly involved C or B agents that either did not actually contain such agents, or were inconsequential.

- **Al Qaeda B in Afghanistan, a mildly serious effort to obtain anthracis but carried out poorly and with no results. This episode is recounted in some detail on the basis of declassified documents in the US Army War College publication, [ASSESSING THE BIOLOGICAL WEAPONS AND BIOTERRORISM THREAT](#), by M. Leitenberg [assessing_bw_threat.pdf](#) , pages 28 to 39.**

Al Qaeda’s second in command, Dr. al Zawahiri, was given advice by two retired Pakistani nuclear scientists who had offered their services to the organization, but as best as is known their advice resulted in no useful assistance to the Al Q BW work. A claim exists that the two Pakistanis had procured a fermenter for Al Q, but there is no public record that any fermenter was ever recovered in Al Q facilities after December 2001, only an autoclave. Al Qaeda did pay a Pakistani PH D microbiologist to buy equipment in Europe, a fermenter in particular, and to procure a pathogenic strain of anthracis, but his efforts failed. The person that al Qaeda assigned to carry out its BW work was a Malaysian with a BS degree from a US college and experience as a medical technician doing

urine and blood tests during his Malaysian Army service. He was unqualified for microbiological work and achieved nothing. The group never had a pathogenic strain of anthracis.

- All reported al Qaeda efforts concerning B in Europe (ricin in France, UK) were either spurious or trivial.
- Al Qaeda C in Afghanistan (killing rabbits or dogs in cages with HCN) are not “CW” (Nevertheless these images and descriptions appeared in hundreds of journal papers, contractor studies, media reports, etc. etc.)
- Either al Qaeda or Taliban in Afghanistan did use commercial agricultural pesticides (arsenical or organophosphorus based) in attacks against girls schools.

Radiological

1. ISIS in Iraq and a missing iridium isotope source used for detecting cracks in hydrocarbon extraction pipelines: the iridium source was recovered, and it had never been in possession of ISIS.

2. ISIS obtained small quantities of natural or low-enriched uranium from a Mosul University physics lab. If these had been used in a radiological bomb there would have been no effect other than its value to frighten people.

3. Two cobalt-60 medical radioactive sources. These had been part of the equipment in a Mosul hospital and had been moved to a storage site on the Mosul University campus. ISIS did not know of the location and made no attempt to recover them. [[Cobalt 60 Sources in Mosul:](#)

Recovery and Lessons for the Future, 22 July 2017, <http://isis-online.org/isis-reports/detail/cobalt-60-sources-in-mosul-recovery-and-lessons-for-the-future/>]

Chemical

1. Al Qaeda/Zargawi network, Jordan, “CW” truck bomb apprehended by Jordanian intelligence. A very large amount of high-explosive chemicals and very small amount of arsenical pesticides. (I was able to obtain the list of all the chemicals present on the trucks from Jordanian government agencies.)

2. Chlorine use by insurgent groups in Iraq

The Al-Abud network, a Sunni group, affiliated with Jeich Muhammad, composed of former Ba’athist security officials and Saddam loyalists.

(a) Starting in October 2004, they began the use of High Explosive truck bombs containing chlorine cylinders. This continued until 2006-2007. The chlorine was dissipated by the HE, was ineffective in this form for CW purposes, and the effort ended. Chlorine tanks were commercially available in the country. Since the attempted CW use was made against coalition forces in semi-combat circumstances, it should be viewed as a failure in the first CW use by an NSA for military purposes. However, during the same time period Sunni insurgent groups were also able to locate remnants of Iraqi CW munitions from the 1980’s and combine these with high explosives to use in roadside IEDs against Allied forces. These again had little effect as chemical weapons, but the HE IED’s were as effective as always.

(b) More importantly, starting in late 2003 the group made successive attempts to obtain usable CW agents by recruiting first an elder Iraqi “chemist” and then a younger Iraqi “chemist”, supplying them with chemical intermediates purchased through sympathetic Iraqi businessmen, and asked them to produce the organophosphate Tabun, and mustard. In some cases the intermediates supplied were appropriate; in others not. The mustard intermediates were apparently the appropriate ones. The Tabun intermediate was malathion, which was not appropriate. Both chemists were incompetent and produced nothing, although the younger chemist produced a very small quantity of ricin on his own. By June 2004 the Iraq Survey Group had dismantled the Al-Abud network. The effort was a complete failure. The final five lines of the ISG Report Annex are false in describing “...the maturity of the group’s CW production, as well as the severity of the threat posed by its weaponization efforts,” which consisted of obtaining a very small number of mortar rounds containing chemicals. The ISG Report Annex additionally erred twice in its last few lines by twice gratuitously referring to the group’s efforts to produce “CBW”. There NO B component to the group’s efforts. The total effort was a failure.

Sources: Iraq Survey Group report (CIA) Annex; 9/30/2004; DOD press release, 6/6/2007; Wikipedia entries for “Chlorine Bombings in Iraq,” “Al-Abud Network; “Jeish Muhammad [JM]”

(c) In 2015 ISIS/ISIL/Daesh succeeded in synthesizing sulphur mustard, the first successful synthesis by a non-state actor or terrorist group since the Aum synthesized

Sarin in 1992-1993, a span of about 22 years. The quality of the mustard was poor, the synthetic pathway used was the simplest, the Levinstein process. Nevertheless, the group had obviously been able to obtain the necessary intermediates. Reports of access to technical expertise or “scientists” is muddled or spurious. (Australian Foreign Minister Julie Bishop, in 2015, “highly technically trained professionals, including from the West”; or many references to “Abu Malik” unknown to the CIA’s Iraq Survey Group and UNMOVIC.) Other reports mentioned the recruitment of “Chechens, Southeast Asians” and a few Iraqi Sunnis who may have been in Saddam’s CW program. However it appears that a single French national was responsible for the work. The effort was very likely facilitated by ISIS control of a large city, Mosul, where work could go on unobstructed without interference, and by substantial income to procure the needed chemical intermediates. Exactly where the intermediates came from is unknown, but control of a large area of territory may also have helped.

ISIS began CW use in 2014 by using chlorine and industrial chemicals in IEDs and Vehicle Borne IEDs. In 2015, they initiated use of sulphur mustard in available mortars and rockets, neither of which had been designed or suited for CW delivery. Therefore agent loss and destruction would have been substantial on weapon detonation. Use was entirely in combat, but the promised sustained use that ISIS had promised in order to defend their control of Mosul did not occur. Production was apparently slow and volume low, the quality of agent poor, and incidence of use was sporadic. Reported casualties after use were very low, no

reported mortality (and no US personnel). Incidence of use tallied by private organizations (Janes/HIS Markit) up to October 2017:

- Number of incidents by country: 48 in Iraq; 28 in Syria
- Number of incidents by chemical agent: chlorine, 28; sulphur mustard, 17; “unspecified”, 31.
- Number of incidents by delivery mechanism: IED, 5; projectile, 60; “unspecified”, 11

Only a handful of the above alleged mustard events were verified by OPCW/JIM investigation, and the above numbers may be substantially inflated. Sources were the Syrian government and ISIS, and both were interested in inflating reports of use. The Syrian government additionally attributed its own extensive use of chlorine to insurgent groups. Notably the proportion of mustard use is not prominent: 17 out of an alleged 76 events.

2A. “Why did Aum’s efforts to develop an anthrax capability fail?”

The answer is short and very direct: most importantly they did not have any pathogenic strain of anthracis, only vaccine strains. They used the Sterne vaccine strain for “production”. They also did not have competent personnel. Production was also faulty. They also had no culture of clostridium botulinum so it was impossible for them to have produced “botulinum toxin“ as innumerable reports stated, even in professional journals.

(In 1999 I published a paper making these points based on information obtained from the chief toxicologist of the Tokyo region. I repeated that explanation in a paper prepared for and published by the National Academy of Sciences in 2006. This was corroborated several years later by two books published in Japan in Japanese, the first by Masaaki Sugishima, a law professor in Tokyo, and the second by Katsuhiko Furukawa, a Japanese government official.)

The person responsible for Aum’s BW work – Seiichi Endo was not a microbiologist but held a Master’s degree in virology and veterinary medicine. However, he did know that if he obtained two anthrax vaccine strains, each lacking a different plasmid, pX01 and pX02, which contain three primary virulence factors and the genome for synthesizing the capsid, then these could by recombination produce the wild type pathogen. The research demonstrating this ability had been published by authors at USAMRIID in 1985 and by Japanese researchers in 1986. Endo had read the Japanese paper as a graduate

student. Sterne is missing the pX02 plasmid and Endo obtained the Pasteur vaccine strain which had the pX02 plasmid by direct order from the Pasteur Institute.

However the technique is very difficult to master even for experienced microbiologists. A post-doctoral researcher in the Japanese lab had failed for six months and had to be sent to the Pasteur Institute in Paris to be trained. Endo claimed to two colleagues that he had succeeded in doing the procedure in two weeks. The two were a PH D metallurgist and an MD in the senior Aum hierarchy, but they were given no responsibility in Aum's BW program. Given their professional backgrounds they probably would have been of no assistance if they had.

2B. "What does this tell us about the terrorist biological weapons threat in general?"

- 1. The perpetrator must have a pathogen.**
- 2. The group must have competent personnel able to perform the microbiological work necessary.**

(The above explains al Qaeda's failure as well.)

3. What groups should be causing concern now and over the next two years?

Two categories:

- 1. Those who have expressed long interest in obtaining CBRN, and particularly if they have taken some initial steps to do so. (If the group is still operational ; Al Qaeda is presumably now very much diminished.)**
- 2. Those showing the greatest general aggressiveness, ambition, innovation, entrepreneurship, administrative abilities, viciousness. At the moment, ISIS seems to fit these indicators the most: pretensions to a “caliphate,” and murderous behavior such as burning, beheading, mass massacres, rape, etc. But ISIS may now (2018) also be too diminished, versus if this assessment was written two or three years earlier.**

Very significant organizations such as Hezbollah, essentially under the control of the Iranian Revolutionary Guard Corps, will presumably not go down this path. Neither will Hamas, for different reasons, although both are militarily strong, control territory and are very well organized.

I cannot identify any other groups.

Ten years ago two U.S. government officials privately stated that several terrorist groups were interested in B. One was a member of an intelligence agency and one was a DOD official. No details, evidence or indicators were given to support the claim, and I was skeptical. If there were such groups, they haven't materialized in the subsequent ten years, and I do not know if any have been

identified by government agencies of the U.S or other countries since then.

4. What CBRN capabilities should cause us the most concern?

Reply is essentially a continuation of question number 3.

Those groups that search for materials, inputs, and qualified personnel, and that establish a working facility.

For B: evidence that a group searches for and/or obtains pathogens.

For C: evidence that a group searches for and obtains chemical intermediates.

For R: evidence that a group searches for and obtains radioisotope sources (example, searching for old Soviet radio-isotopic SNAP packages located in CIS countries)

For N: evidence that a group tries to buy smuggled HEU. The 20 year history of former USSR and East European individuals and smugglers enticed by BND sting operations in Germany, etc. A database on incidents of trafficking, smuggling, and theft of nuclear and radiological materials is maintained by the International Atomic Energy Agency (IAEA) in Vienna. The end of the German government sting operations seems to have dried up the exit of primarily former Soviet HEU submarine nuclear reactor fuel pellets. (When not fraudulent “red mercury” scams.)

And for all of the above, evidence of recruitment of capable professionals, or of such individuals voluntarily offering their services to the terrorist groups.

5. What is the most concerning “over the horizon” threat?

Except perhaps for Global Climate Change, I don't believe that it is possible to foresee the international political climate in 10-15-20 years. Possibly not even five years ahead in particular volatile areas of the world, which includes those areas where terrorists and non-state actors are most active.

1. **Nuclear**: Assuming that the question concerns true nuclear weapons, and not radiological devices, this would be by far the most dangerous eventuality. However, it is also the least likely. The presumption has always been that this would be a gun-type weapon using HEU. In a polemic with two nuclear weapons specialists ten years ago in *Foreign Policy* I consulted with 4-5 nuclear weapon experts with the very highest relevant clearances. All agreed with the position that I took, which is that even if the group obtains a sufficient amount of HEU, it still is not a simple endeavor that could be achieved by a relatively small number of individuals.

2. **Biological**: “Novel biological weapon agents”.

See the DUAL USE RESEARCH OF CONCERN (DURC)-Gain of Function table immediately below: these are not to be expected from terrorists and non-state actors.

It is 25 years from Aum's attempts and 20 years from the al Qaeda's. Analysts now have the benefit of that interval to understand what has happened or didn't happen, compared to analysts directly after 2001-2002, who worked

in an environment that led to great apprehension which essentially fed on itself.

3. Chemical: the severe weakening of the Chemical Weapon Convention. A new factor was introduced by the Syrian government's use of the chemical nerve agent sarin on multiple occasions over a span of five years in its civil war, and the strong and critical support by the Russian government for that use. Russian efforts in the United Nations Security Council and at the OPCW in support of the Syrian government permitted Syria to continue using chemical nerve agents in combat. In addition in 2018 the Russian government used an advanced chemical nerve agent in the United Kingdom in an assassination attempt, in the same way as it used the radioactive isotope polonium several years earlier in a successful assassination of a former Russian intelligence agent.

What effect these events will have on the use of chemical weapon agents by other states or non-state actors in the coming years cannot be foreseen at present. However the effect will certainly not be to reinforce the CWC prohibition against the use of chemical agents or weapons

DUAL USE RESEARCH OF CONCERN [DURC] AND GAIN OF FUNCTION [GOF] STUDIES

Scientist(s) identified in the publication*	Year published	Subject	Ostensible rationale	No. of scientists/ technicians involved	No. of years of antecedent
1 Ronald Jackson and five (Australia)	2001	Insertion of Interleukin-4 into mousepox virus	Development of immunocontraceptive vaccine for rabbits		
2 E. Wimmer and two (US)	2002	Synthesis of Poliovirus DNA from synthesized oligonucleotides using the virus's published DNA sequence	Proof of concept for de novo reconstitution of virus	Around 20 (?)	~ 20
3 A.M. Rosengard and four (US)	2002	Introduced a gene for a gene a variola virus immunosuppressive factor into vaccinia virus	Understanding basis for immunosuppression		
4 Peter Palese and Adolfo Garcia-Sastre and nine (US)	2005	Reconstructed 1918 pandemic influenza virus	Understanding basis for high case fatality rates in 1918 pandemic		
5 Yoshihiro Kawaoku and three (US)	2012	Created an animal model aerosol transmissible influenza (H5N1) virus	Assessing possibility for emergence of mammalian transmissible H5N1 strains		
6 Ron Fouchier and twelve (Netherlands)	2012	Ditto. And determined the gene changes that made this possible	Assessing possibility for emergence of mammalian transmissible H5N1 strains		
7 David Evans and two (Canada)	2018	Synthesized horsepox DNA using the virus's published DNA sequence.	Development of (another) smallpox vaccine		

* All authors were academically based but some co-authors of Palese had CDC affiliations, and some co-authors of Evans have corporate affiliations.

3. Domestic US groups pursuing/using CBRN:

It is not useful to ask “C, B, R, N” : disaggregate them and examine each separately.

The US experience of B is at the two ends of the scale:

- Ricin, repeatedly in the 1960’s from right-wing groups (Minutemen, Chicago), and from individuals using it as a murder weapon,
- The most meaningful and potentially very dangerous instance was the “Amerithrax”/anthrax letters, for which Bruce Ivins at USAMRIID is assumed to have been responsible. The relevance of Ivins to expectations of non-state actor and terrorist group acquisition of BW cannot be overemphasized.
 - He had full access to the most virulent anthrax strain known to the US BW program. It was his daily working tool for over 20 years.
 - He was super-experienced, with technicians almost as experienced as he was in some cases.
 - His working place was the most advanced BW facility possible.
 - There were contributions to his stock of dry powder anthracis from other people working at the Dugway Proving Ground and at the Battelle Corporation, a defense contractor, which means additional assistance of highly experienced and competent laboratory workers.
 - He was not removed from working at USAMRIID by his laboratory superiors despite known psychiatric problems.

The very greatly increased US biodefense program since 2003 – the number of accredited laboratories and the number of accredited researchers – has in fact increased the risk of a similar incident, although it is assumed that it will not recur. Prior to 2002 the number of relevant labs were probably under fifty, and the number of researchers under 500. After a 20-40 fold increase in funding after 2002 the numbers rose by 2011-2013 to 350 US institutions and about 15,000 US researchers. With a subsequent small decrease in funding those numbers declined by 2016 to 276 US institutions and 9,663 US researchers.

4. Transnational criminal groups pursuing or using BW.

I have no knowledge of any evidence of that to date.

However some of these groups located in Eastern European countries may have been involved in the smuggling of small amounts of natural Uranium, LEU or HEU (or the associated “red mercury” scams) into Western Europe.

6. “How can the intelligence community incorporate insights from science and technology studies to improve assessments of the CBRN threat from terrorists?” and “The role that analytical frameworks play in the analysis of those threats.””

Since the mid-1980s there have been two dogmas in conceptualizing the B part of the CBRN threat.

1. Biotechnology is advancing constantly, leading to increased possibilities of manipulation of microorganisms.

2. Biotechnology is spreading all over the world

- to more and more countries
- to more and more capable performers, and their age and educational level decreases.

That is all true, but it is not (yet) the driver of non-state actor and terrorist acquisition of BW. Or not until they recruit individuals with the ability to make use of advanced biotechnology.

Look to the indicators mentioned earlier and not to the science and technology. *Advancing biotechnology is the wrong analytical framework for the near term and for the foreseeable future.*

Look again at the DURC table, and “Gain of Function” research. When first synthetic biology and then CRISPR appeared, there was in each case an outpouring of speculation about the significance of these genetic engineering technologies for Bioterrorism:

- However that is not what non-state actors and bioterrorists will do.
- They will do what the Aum tried to do, and al-Qaeda.
- They will do what Iraq did ([Comprehensive Report by the Special Advisor to the DCI on Iraq's WMD, 30 September 2004.](#))
- They will do what South Africa did (Chandre Gould and Peter Folb, [Project Coast: Apartheid's Chemical and Biological Warfare Programme](#), UNIDIR, Geneva, 2002).
- They will do what Rhodesia did (Glenn Cross, [Dirty War: Rhodesia and Chemical Biological Warfare 1975-1980](#), Helion and Company, 2017).
- They will start with A, B, Cs, and are not likely to do that well to begin with.

A Very Brief Summary

Looking back at the past 20-25 years, one can conclude that there has been some activity, nearly all concerning C, chemical weapons. It is possible that it may continue from that baseline and increase incrementally. However the responsible group has been considerably diminished by combat. ISIS achieved a breakthrough, but the next few years will indicate if it is able to continue its CW program or not.

As an overall summary:

- Nothing has occurred in B, R, N.
- Minimal in C, and the agent produced was used as a weapon in combat. Production was very small, the product low-grade, and its effectiveness very poor.

It was always desired, but acquisition took a long time. The religious fatwas and exhortations so often quoted twenty-plus years ago that were referred to as motivators for Jihadist groups to obtain WMD were of no consequence, nor were the famous “jihadi handbooks.”

- There was no leakage of personnel, technology or materials from existing or former state programs to NON-state actors in B, C, R, or N except for small amounts of Soviet nuclear submarine reactor fuel which were bought up by western intelligence agencies and are not known to have fallen into the hands of any terrorist group.**
- Assistance or recruitment of competent knowledgeable professionals in C, B, R and N activities since the Aum experience was minimal to none, the exception being a single PH D microbiologist recruited and paid to assist the al Qaeda BW effort. However he did not want an instrumental role in their effort and was not offered one, and his assistance proved to be minimal and of no consequence.**