

# CBW

# Magazine

Journal on Chemical and Biological Weapons

Winter / July-December 2015

ISSN: 0974-0619

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INSTITUTE FOR DEFENCE  
STUDIES & ANALYSES

रक्षा अध्ययन एवं विश्लेषण संस्थान

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# Editorial

## Executive Editor

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Since 2013, the OPCW has worked towards destruction of the Syrian chemical weapons stockpile. However some chemical weapons are still present in Syria and may fall into the hands of those who can misuse them. This clubbed with the recent terrorist attacks on Paris on November 13, 2015 has re-energized the talks surrounding the use of Chemical and Biological Weapons and it appears that presently the threat extends beyond Syria. The fear of an imminent ISIS chemical weapons attacks in Paris is further strengthened by the statements made by the French Defence Minister Jean-Yves Le Drian. With this backdrop, Animesh Roul's article discusses the chemical weapons used by ISIS in Syria.

The issue also carries the speech delivered by the Director-General of OPCW, H. E. Ahmet Üzümcü, at the Institute for Defence Studies and Analyses on September 3, 2015. The speech is titled, "Reinforcing the Norm Against Chemical Weapons".

Munish Sharma in his article discusses the importance of cyber security in safeguarding the chemical industry. The book review by Chandreyee Chakraborty discusses the role of the scientists during wars and how careers of various scientists took different growth trajectories after the World War II and the Vietnam War.

This issue also comprises other regular features like the Chemical and Biological News.

With our readers' feedback, we wish to publish issues in the future that focus on a subject of particular concern.

**Contributions and feedback are welcome and can be addressed to:  
editorcbw@gmail.com**

## Chemical Anarchy: Islamic State, Chemical Weapon and Syrian War Theatre

Mr. Animesh Roul

*The author is the Executive Director and Co-founder of Society for the Study of Peace and Conflict (www.sspconline.org). Roul has been associated with BioWeapons Prevention Project (BWPP), Geneva as a lead author for India and Pakistan Country Reports for BioWeapons Monitor since 2010 and also involved as network member of Chemical Weapons Convention Coalition (CWCC), The Hague.*

### Summary

There has been an increase in speculations surrounding the possible use of chemical and biological weapons in the aftermath of Paris massacre. These fears and speculations are not random or isolated. They emerge from events in the war theatres of Iraq and Syria that witnessed increasing use of chemical weapons such as chlorine and mustard gas against civilians and military alike across the globe after the outbreak of Ebola virus.

Some big questions following the aftermath of Paris massacre are two-fold. Firstly, whether the so called Islamic State (IS) would now look to acquire capability to develop or use strategic weapon systems, including those that are chemical and biological in nature, to overcome its conventional military inadequacies in Iraq and Syria; and if the IS would venture out with these insidious weapon system, especially chemical weapons, to attack foreign capitals. The answer is far from negative.

Arguably, speculations are rife among international experts, including those serving in the French and US governments, about the possibility of Chemical and Biological weapon attacks. French Defence Minister Jean-Yves Le Drian has said that a chemical or biological weapon strike is among the risks emanating from the IS. The French prime minister too expressed similar apprehension few days ago.

Earlier, both Iraqi and US intelligence officials claimed that the IS group (ISG) is aggressively pursuing the development of chemical weapons. Talking to the Associated Press, they claimed that the ISG had already set up a centre with a team of scientists to research and experiment the weapons.

These fears and speculations are not random or isolated, rather stemmed out of events in the war theatres of Iraq and Syria that witnessed increasing use of chemical weapons such as chlorine and mustard gas against civilians and military alike.

### CW incidents in Syria<sup>1</sup>:

The United Nations and Organisation for the Prohibition of Chemical Weapons (OPCW) have already confirmed the indiscriminate

use of chemical weapons against civilians in the on-going Syrian Civil War. Host of independent agencies and other sources active on the ground too have verified these events. In the last few years, there have been many blatant cases of chemical weapon attacks. Some of these incidents have been investigated and confirmed by leading world agencies like the United Nations High Commissioner for Refugees (UNHCR) and Human Right Watch, while some other cases remain controversial or under-reported.

The most deadly attack took place in Khan al-Assal and in Ghouta between March - August 2013, in Syria where various estimates suggest that no less than a couple of thousand people died and scores bore the brunt of the deadly gases.<sup>2</sup> The UN and Russians led separate investigations and confirmed the use of Sarin nerve agent and chlorine in both the attacks; they could not, however, ascertain the perpetrators of the crime -- whether it was the government that was behind these attacks or the rebels or militant groups.

Almost two years after Khan al Assal incident, which took place on March 19 (2013), once again the spectre of chemical weapon returned to haunt inhabitants of Sarmin (Idlib province) in the northwestern Syria.<sup>3</sup> There were allegations and counter allegations regarding this. Syrian opposition group claimed that Bashar al-Assad's government carried out the chlorine gas attack in Sarmin, while the Syrian regime denied any such acts.

It is a widely known fact that the previous regime in Iraq and the present Syrian government are known to have stockpiled chemical weapons in their military arsenals. Whether these state controlled arsenals are falling in the hands of the IS or other militant factions presently engaged in a prolonged civil war in the region is largely unknown.

However, reports suggest that the IS has seized large swathes of territory both in Syria and Iraq and is feared to have controlled the remnants of CW stockpiles and infrastructures.

Even though Syria joined the OPCW, the international implementing body of the Chemical Weapons Convention, following the deadly Ghouta attack and declared its chemical weapon arsenal, which were destroyed subsequently under international supervision, many fear that Syria still has undeclared arsenal, especially chlorine. Syria didn't include chlorine stockpiles on its list of declared chemical weapons, as it does not fall under weapon category.

### **Islamic State's Chemical Jihad?**

The claim from the IS side regarding the possession of chemical weapons, such as Mustard agents, came in late August this year from a Dutch soldier turned ISIS fighter identified as Omar Yilmaz, who indicated that the group has acquired chemical weapons once belonging to Syrian President Bashar al-Assad. Yilmaz's revelations came with a series of suspected incidents of mustard gas attacks in northern Iraq and Syria.<sup>4</sup>

Independent sources such as Conflict Armament Research (CAR) and the Syrian Observatory for Human Rights (SOHR) have claimed that the IS has used chemical weapons several times against Kurdish forces between January -June 2015. In August this year, the German Defence Ministry too reported IS's chemical weapon use in Erbil in Iraqi Kurdistan. The same month, the United States officials stationed in Iraq claimed that ISG have used sulphur-mustard in a mortar attack on Kurdish forces in Makhmour town located in Northern Iraq. The location has been in the news and a battlefield between the Kurdish forces and the Islamic State.<sup>5</sup>

A month after, US agencies found leads to show that ISG is making and using crude chemical weapons such as mustard agents in a powder form in Iraq and Syria. In September, a senior Russian Foreign Ministry official informed that Islamic State group has obtained the scientific documentation necessary to produce chemical weapons. According to Hakim Al Zamili, the head of the Iraqi parliament's security and defence committee, IS has been working towards production of chemical weapons, particularly nerve gas.<sup>6</sup>

## Outlook

Numerous indications of IS having used CW notwithstanding, there are doubts or unanswered questions about its capability to conduct or unleash any large scale chemical weapon attacks in Western countries or even within its territory against rival fighting forces. However, if the Islamic State finds psychological or physical effectiveness of chemical weapons, by perpetrating mass fear and disruption, its use against western targets or civilian populace in European capitals or elsewhere would be a reality soon.

## Endnotes:

1. A graphical details of purported Chemical weapons use in Syria and Iraq can be found here, <https://activist1.wordpress.com/2015/09/03/from-a-gassed-grandfather-to-alleged-use-of-chemical-weapons-by-is-the-horrors-of-mustard-gas/>
2. For one such reports citing multiple case of CW use in Syria, See "UN: Multiple chemical attacks likely in Syria", Al Jazeera, December 13, 2013, <http://www.aljazeera.com/news/middleeast/2013/12/un-chemical-weapons-syria-attacks-20131212224042210713.html>
3. "Syria: Chemicals Used in Idlib Attacks: Security Council Should Act Decisively to Establish Responsibility" , Human Right Watch, April 13, 2015, <https://www.hrw.org/news/2015/04/13/syria-chemicals-used-idlib-attacks>
4. See, Omar Yilmaz's statement cited in "Where Did ISIS Get Its Chemical Weapons?", Daily Beast, September 2, 2015, <http://www.thedailybeast.com/articles/2015/09/02/where-did-isis-get-its-chemical-weapons.html>
5. Andrew Tilghman, "U.S. confirms Islamic State use of chemical weapons, Military Times, August 21, 2015, <http://www.militarytimes.com/story/military/2015/08/21/isis-used-mustard-gas-makhmour-against-kurds/32116637/>
6. "ISIS determined to produce chemical weapons: say officials" Al Arabiya, November 19, 2015, <http://english.alarabiya.net/en/News/world/2015/11/19/ISIS-determined-to-produce-chemical-weapons-say-officials.html>

## **“Reinforcing the Norm Against Chemical Weapons”**

### **Speech at the Institute for Defence Studies and Analyses, by H.E. Ahmet Üzümcü, Director General, OPCW**

#### **September 3, 2015**

#### **Summary**

This is the text of the speech delivered by the Director-General of the OPCW H.E. Mr Ahmet Üzümcü at the Institute for Defence Studies and Analysis, New Delhi on September 3, 2015. He spoke on *Reinforcing Norm Against Chemical Weapons*.

Ladies and Gentlemen,

I am delighted to address such a distinguished audience of policy-makers and military and civilian experts here in New Delhi.

At the outset, I would like to express my appreciation to the National Authority of India and the Ministry of External Affairs for inviting me to your beautiful country. It is a great pleasure for me to be back in New Delhi.

The Government of India has always provided excellent support for the work of the Organisation for the Prohibition of Chemical Weapons (OPCW).

I appreciate the strength of your country's commitment to achieving full and effective implementation of the Chemical Weapons Convention.

India's involvement in chemical disarmament spans the horizon of our work to eradicate these abhorrent weapons, to ensure they are never again made or used.

Whether through tangible actions in chemical disarmament, robust implementation of the Convention's provisions, or leadership in fostering international cooperation, India has been very active in reinforcing the global norm against chemical weapons.

And with India's regional and global influence, coupled with its burgeoning chemical industry and education sectors, my message today is a simple one.

India's ongoing engagement will be vital for achieving our goal of a world permanently free of chemical weapons.

Allow me to further expand on these thoughts.

By now, the economic growth that India - and the greater Asian region - has achieved is well known. By some estimates, India's economy will soon become the world's third largest. Your country's economy is among the primary drivers powering Asia's growth, and will remain so in years to come.

This growth has translated into increased trade and investment, and with it, tighter economic integration between countries in the region, which of course enhances peace and stability. This is very much welcomed by the international community.

Today I will outline how the text of the eighteen year old treaty that underpins the OPCW's work provides a framework for effective collaboration between government, industry and science to enhance our security.

Before doing so, let me point to some highlights of our Organisation's activities and account for some of its accomplishments.

Less than two decades after the OPCW commenced its operations in The Hague, we have notched several important milestones in ridding our planet of chemical weapons.

Since 1997, eight OPCW Member States have declared over 72,000 metric tonnes of chemical weapons. Of these declared stocks, more than 90% have now been destroyed.

All destruction activities and declarations submitted by our Member States are subject to verification and monitoring implemented by the OPCW - and with exceptional rigour.

To ensure that dual-use chemicals are being produced exclusively for peaceful purposes, some 3,000 OPCW inspections of chemical industrial facilities have been carried out in more than 80 States Parties. In addition,

nearly 3,000 inspections have been implemented at facilities relating to the production, storage, and destruction of chemical weapons.

In a demonstration of the truly global reach of our work, 191 states have signed on to the Convention. Last month, India's neighbour Myanmar has become our newest member.

Near universal adherence to the Convention reflects an entrenched global consensus that such weapons are inhumane, and that their use is taboo.

It was Mahatma Gandhi who said, "The greatness of humanity is not in being human, but in being humane." This speaks meaningfully to the ideals of the Chemical Weapons Convention.

For what can be more humane than forever banishing some of the cruelest weapons ever created, and ensuring that future generations never experience the suffering they cause?

Perhaps no chapter in the OPCW's relatively short history embodies the international consensus against chemical weapons more clearly than our recent activities in Syria. Such activities which, despite a multitude of challenges, brought about some remarkable achievements.

In less than one year following the OPCW Executive Council's decision in September 2013 on a destruction programme for Syria's chemical weapons, we were able to remove all declared weapons from Syrian territory and destroy 98 percent of them, including all stocks of category one chemical weapons.

The challenging operation to transport and destroy Syria's chemical weapons - amid a brutal civil conflict - would have been impossible without the extraordinary international effort that supported it.

This effort encompassed technical and financial contributions from more than 30 countries, in addition to vital security and logistical support from the United Nations.

India was among States Parties who generously contributed to the Syria trust fund.

China and the Russian Federation provided vital equipment in this effort, and Denmark and Norway made naval assets available to the mission. The United States provided a platform at sea for destroying sulfur mustard and a precursor chemical for manufacturing the deadly nerve agent sarin. Finland, Germany, the United Kingdom and the United States made facilities available for the destruction of toxic chemicals.

At every stage of these operations, OPCW inspectors verified removal and destruction activities.

Executing this complex exercise required not only consensus of commitment, but also consonance of action.

Prior to Syria joining the Convention, OPCW inspectors had played an integral role in the UN investigation of alleged use of chemical weapons in Syria. That investigation confirmed that sarin had been used to horrific effect in the Damascus suburb of Ghouta in August 2013. Our activities in Syria continue to this day, a topic which I will return to shortly.

Ladies and gentlemen,

We expect to achieve complete destruction of all declared chemical weapons by 2023, within the next eight years. When reached, this will mean nothing short of the eradication of an entire category of weapons of mass destruction - a singular success in the history of disarmament.

And we were honoured - and taken by surprise - when our efforts attracted the attention of the Norwegian Nobel Committee, when the OPCW was awarded the Nobel Peace Prize in 2013.

India is a strong partner in these efforts.

As one of the first countries to sign the Chemical Weapons Convention in 1993, India ratified the treaty in 1996, and the Convention entered into force early the following year. Your diplomats and technical experts were actively engaged in the negotiation of the Convention and in early efforts leading to the establishment of the OPCW. India is well represented in the major committees and bodies of the chemical disarmament regime, and its National Authority for the Chemical Weapons Convention has worked to ensure robust domestic implementation. India is also home to two OPCW-designated laboratories, institutions that are linked to a global network of centres of excellence that underpin our verification efforts.

And the OPCW is now benefitting from the broad experience of its newly appointed Deputy Director-General, Ambassador Hamid Ali Rao, one of India's most seasoned diplomats. I also had the distinct pleasure and privilege to work closely with Ambassadors Mukherjee and Prasad during their tenure in the Hague. They have greatly contributed to the work of the OPCW. It is also a pleasure to see some colleagues who have worked earlier within the National Authority of India or at the Secretariat.

India's commitment to the ideals of the chemical weapons regime was perhaps best demonstrated shortly after the Convention entered into force, by its expeditious destruction of its chemical weapons stockpile.

Even with the support of valuable partners such as India, more needs to be done to make our gains in global chemical disarmament permanent.

Let me now briefly address some of the critical issues that are posing challenges in this regard.

First, a small number of countries have yet to join the Convention, some of which are highly relevant to its aims and scope. Despite wide recognition that chemical weapons are totally unacceptable and illegal under international law, five States remain outside this global ban - namely, Angola, Egypt, Israel, North Korea and South Sudan. We have recently seen promising signs that Angola and South Sudan are moving to join the treaty.

Let me be clear: with 191 countries within the Convention, there can be no strategic - or moral - justification for any ambiguity on chemical weapons.

To build a truly universal front against these monstrous weapons, we remain steadfast in our calls to the remaining five States not Party to the Convention to join without delay.

A second, and more sinister challenge has been the ambitions of some non-state actors to acquire - and use - weapons of mass destruction.

Recent reports alleging use of chemical weapons by Da'esh serve as a stark reminder of the threat and consequences of terrorist groups using such weapons.

We at the OPCW have serious concerns about such reports and are in close contact with relevant States Parties on this matter.

Most of the international non-proliferation norms are ill-equipped to address the threat of non-state actors acquiring chemical

weapons and other weapons of mass destruction since they were largely negotiated and concluded with states in mind.

We cannot, however, sit idle as these threats continue to grow.

While we are not a counter-terrorism organization, the OPCW's mandate does not distinguish between state or non-state actors. It is to exclude completely the possibility of the use of chemical weapons.

To this end, we are actively exploring ways of extending our reach, through better coordination with our Member States and international organisations across a range of measures to prevent - and respond to - acts of terrorism.

Returning to Syria, we recently marked two years since the ghastly chemical attack in Ghouta.

Following the removal and destruction of Syria's chemical weapons, we continue to advance efforts to destroy declared chemical weapons production facilities in Syria. We are also working with the Government of Syria on its declaration. The purpose is to make sure that the declaration is complete and accurate.

Further, as allegations of use of such weapons persist, our Fact-Finding Mission continues to investigate them. In September last year, this mission concluded, with a high degree of confidence, that chlorine had been used as a weapon in three villages in northern Syria.

More recently, a new dimension to our activities in Syria has got underway.

Last month, the UN Security Council adopted resolution 2235, which calls on the UN Secretary General, in coordination with the OPCW Director-General, to establish a Joint

Investigative Mechanism to identify the governments, individuals or groups that have carried out, or sponsored, attacks using chlorine or other toxic chemicals.

This development represents a defining moment for the international community's determination to pursue allegations of non-compliance with the Chemical Weapons Convention.

I am confident that our staff will make a significant contribution to the work of the Joint Investigative Mechanism.

Though our mission to eliminate Syria's chemical weapons has brought a great deal of attention to the OPCW and its mandate, there are less widely known facets of our work that are equally important - and have particular significance in relation to the expertise that India brings with it.

India's economic development has seen a corresponding expansion of its chemical industry. Your country's chemical industry now accounts for more than two percent of annual GDP, and the country has the second-largest number of declared facilities within the OPCW's inspection regime. This speaks to India's commercial and technical innovation, and represents an important factor in the country's economic growth. Through first-rate research laboratories and expanding industrial capacity, India can usefully extend its chemical safety and security expertise to OPCW Member States through technical cooperation.

This would be especially valuable for our Member States with nascent chemical industrial capacities.

The OPCW, for its part, continues to work with all relevant stakeholders to strengthen the capacity of our Member States to respond promptly and effectively in the

event of accidents or incidents involving toxic substances.

One need only recall the painful legacy of Bhopal, or the recent events in Tianjin, to remind us of the importance of ensuring robust chemical safety and security practices.

Such practices must extend across all relevant sectors, including national authorities, chemical industries, industry associations, regulators, laboratories and academia.

Additionally, the OPCW works to disseminate its institutional experience and knowledge to States Parties to assist them in the development of protective capacity against chemical weapons, in the eventuality that they are confronted with the use of chemical weapons.

Every Member State of the Chemical Weapons Convention has the right to request assistance and protection in this regard under Article X, and for our part, the OPCW is working closely with its members to ensure we have sufficient capacity, expertise and resources in this area. India's expertise can be of great benefit, in no small part thanks to its CBRN defense capabilities.

Another area in which India can lead is through education.

We have long asserted that the lessons underpinning the education of chemistry be imbued with principles of responsible science. For the task of eliminating chemical weapons - and ensuring that they never re-emerge - must begin in the classroom.

I welcome the recent initiative of India's University Grants Commission to encourage the education of the peaceful uses of chemistry in universities across the country.

By fostering a culture of responsible science and raising awareness of chemical disarmament, India is taking an active role to ensure the success of our global mission.

For its part, bodies such as the Institute for Defence Studies and Analyses can amplify the yield of these efforts by fostering dialogue at the intersection of policy, science and industry.

For the OPCW, such efforts are part and parcel of the Convention's broader promotion of the peaceful uses of chemistry. Through Article XI of the Convention, the OPCW actively promotes international cooperation in the peaceful uses of chemistry.

In turn, States Parties, in particular those whose economies are developing or in transition, are offered a range of capacity-building and training opportunities designed to transfer knowledge and enhance skills for the use of chemistry for peaceful purposes.

Such activities encompass sponsorship programmes in chemical research, the development of laboratory capacity, and specialised training in the safe management of chemicals.

I would like to offer a final point regarding the dangers posed by some widely traded industrial chemicals.

One need only recall the confirmation by the OPCW Fact-Finding Mission that chlorine had been used as a weapon in Syria is a stark reminder in this regard.

Because of their toxic properties, we often call them dual-use chemicals.

Take chlorine, for example - it serves a vital purpose in purifying municipal water supplies and as a detergent, but it can also be used as a choking agent to injure and kill people.

These chemicals might not be ingredients for manufacturing deadlier warfare agents, such as those on the Chemical Weapons Convention schedules, whose export is subject to reporting obligations. But their accessibility makes them potentially attractive.

We must therefore be vigilant in monitoring the movement of dual-use chemicals, especially in and around conflict zones, and in relation to any suspicious orders elsewhere.

We must work more effectively at the national level with law enforcement authorities, better scrutinise end-user certificates and share export data at the international level to prevent dual-use chemicals from falling into the wrong hands. This can be done without in any way curtailing trade. It is in fact in all of our interests, including commercial interests, for the chemical trade to be at all times secure.

Diversion of legitimate trade in dual-use chemicals from its stated purposes erodes corporate reputations and can only be bad for business all round.

It is my hope that India can continue to play a leading role to seek solutions and assist in the implementation of many of these efforts, and further support the OPCW in strengthening the national implementation of the Convention in our Member States.

The words of C.V. Raman, an Indian physicist who was awarded the Bharat Ratna and the 1930 Nobel Prize for Physics, are highly relevant for the current standing of our regime. I quote, "Success can only come to you by courageous devotion to the task lying in front of you, and there is nothing worth in this world that can come without the sweat of our brow."

Though we are rapidly approaching our goal of global chemical disarmament, we still have much to do to ensure a future free from the threat of chemical warfare. For its part, India's commitment has been demonstrated not by lofty speeches, but through concrete actions.

Soon to become the world's most populous country, India can give even greater voice to our collective efforts to ensure future generations never again bear the horrors of chemical weapons.

It can speak to the power and supremacy of diplomacy over conflict.

It can bolster multilateralism to further disarmament efforts.

And it can harness its immense resources, especially those of its scientists and industry, to ensure chemical weapons remain a scourge of the past.

Thank you.

## Chemicals, Controls and Cyber

Mr. Munish Sharma

*The author is an Associate Fellow with the Cyber Security Project at IDSA, New Delhi.*

### Summary

Process automation across industries depends heavily on Industrial Control Systems for monitoring, controlling and supervision. Computer viruses and worms specifically designed to target these control systems deployed in the chemicals processing facilities could be a potent threat if Toxic Industrial Materials are released into the atmosphere, following an engineered accident(cyber attack).

### Introduction

In October 2008, a series of explosions at the aniline plant of Jilin Petrochemicals in Northeast China killed five workers and injured about seventy. Aniline, a toxic organic compound leaked into the Songhua River and polluted the drinking water for millions of people. The investigation concluded that a valve was left open, and as a result temperature rose rapidly and the stocked nitrobenzene, benzene and nitric acid also caught fire and exploded.<sup>1</sup> Accidents taking the shape of disasters are rare in the chemical industry, but these rare instances have severe consequences for public safety, public health and environment. These accidents could arise out of an equipment failure, a human error, a physical attack or an advanced cyber-attack having dire physical consequences.

The rise in the number of cyber-attacks on the control systems of the Critical Infrastructure installations function is a precursor to the upcoming change in security perception of the enterprises engaged in deployment and operations of such installations. Computer viruses and worms specifically target Industrial Control Systems (ICS), which are the building blocks of industrial automation deployed in electricity grids, power generation, and chemical processing plants and so on. Chemicals throughout their life cycle, formulation, usage, storage, and distribution or transportation need security from threats including terrorism and accidents. The threats could be significant, as some of the facilities possess highly toxic materials, which may be transformed into weapons, while an attack on a high-risk facility could cause a significant number of deaths and injuries.<sup>2</sup> There are very few reported instances of

cyber incidents at chemical plants only four of such incidents were reported to the U.S. ICS-CERT<sup>3</sup> in 2014. Although, the number could be high, but small incidents are generally not reported as companies do not publish such information.<sup>4</sup>

## **Chemistry of Cyber Threats**

Cyber attacks on a Chemical facility could manifest in two ways. It could either be an espionage operation to gain access to the intellectual property such as formulation or process flow diagrams, or an attack on the ICS, which control critical functions of the plant and a malfunction arising due to a well mounted attack may have physical consequences. The Nitro Attacks of 2011 stole intellectual property such as design documents, formulae, and manufacturing processes, targeting private companies involved in the research, development, and manufacture of chemicals, using a Remote Access Tool (RAT) called Poison-Ivy.<sup>5</sup> Therefore, along with ICS networks, it is equally important to secure the process flow documentation. A generic cyber attack on the control systems network may at the most gain access to the sensor sending real-time information back to the control room, or manipulate measurements to alter the instructions sent by the controllers, which may set the safety mechanism to trigger alarms or at the most, shutdown the process. But process flow documents have ample information for the attacker to strike at the point where consequences are catastrophic.

The malware unveiled in 2010, Stuxnet, targeted the Programmable Logic Controllers installed at various nuclear facilities in Iran. Consequently, it exposed the vulnerabilities hidden in the process control systems, which are an integral part of plant automation across the industries. Perhaps, enterprise software vendors such as

Windows and Apple have become security-oriented, but the ICS, with a higher lifespan, still run on legacy systems which were not designed from security point of view. Hence, ICS is an easy and obvious target for attack. In terms of security management, ICS and their networks are fundamentally different from the enterprise networks and assets. The foremost priority for enterprise networks is confidentiality, but ICS are built on availability and integrity. ICS are designed to last for decades, and they need to be operational round the clock, ensuring availability. It is operationally not feasible to shut them down for regular software updates or patch installation even in the case of an attack. The development and deployment of ICS solutions is highly customized, according to the requirements of the specific industry and the specific plant. Despite the difference, both enterprise networks and ICS are under constant threat from attackers gaining access to the networks for espionage and possibly for sabotage as well. The risk increases manifold for the chemical facilities dealing with materials which are toxic and have proven health hazards if released in the environment.

## **Vulnerable Toxic Industrial Materials**

The Chemical Industries store and process various materials or chemicals, but some of them are classified as Toxic Industrial Materials<sup>6</sup> (TIMs), including Chlorine, Hydrogen chloride, Nitric acid, Ammonia, Vinyl Chloride and Methyl Isocyanate. Toxic Industrial Materials are widely used by the fertilizers, textiles, plastics, pesticides and petrochemical industries.<sup>7</sup> TIMs have well-known hazards for biotic life, specifically humans. Chlorine, Phosgene and Hydrogen Cyanide were used to kill thousands of soldiers during the First and Second World War.<sup>8</sup>

Given the fact that a lot of TIMs are stored, processed and transported throughout the globe, acquired TIMs or a sabotage amounting from a cyber attack on the control systems pose a potent threat. TIMs are likely to be used by terrorists to launch a chemical attack. The stringent controls on Chemical Warfare agents coupled with ease of availability and production in large volumes of TIMs make them a lucrative option. Due to the ease of availability and known hazards, these chemicals would be easier for terrorists to use than chemical warfare agents to cause mass casualties and destruction. The rise in the number and sophistication of attacks on enterprise networks of chemical industries and industrial control systems of their faculties have already raised alarms with the security professionals and senior management.

## Conclusion

One of the worst accidents in the history of chemical industry, the Bhopal Gas Tragedy of 1984 claimed lives of 3800 people and injured 11,000, when methyl isocyanate from the Union Carbide facility was released. The chemical industry certainly cannot afford an incident of the scale of Bhopal gas tragedy, either accidentally or triggered by a cyber attack on the Industrial control systems. Large international firms do recognize the imperatives of cyber security in chemical industry, but for small enterprises it is an expensive affair.<sup>9</sup> Since many cyber incidents do not get reported to the government, coordination and exchange of information within the industry will form the first line of defence against the common cyber threats. Voluntary participation is not sufficient in the face of the sophisticated threats and the risks involved; a comprehensive regulatory framework is warranted to secure the enterprise networks and most importantly, the industrial control

systems of the chemical industry to ensure that Toxic Industrial Materials do not take the form of chemical warfare agents.

## Endnotes:

1. "A guide to major chemical disasters worldwide", available at <http://www.icis.com/resources/news/2008/10/06/9160653/a-guide-to-major-chemical-disasters-worldwide/>
2. "Chemical Security and Resilience", available at <http://www.dhs.gov/topic/chemical-security>
3. The Industrial Control Systems Cyber Emergency Response Team (ICS-CERT) operates within the National Cybersecurity and Integration Center (NCCIC), a division of the Department of Homeland Security's Office of Cybersecurity and Communications (DHS CS&C). ICS-CERT provides focused operational capabilities for defense of control system environments against emerging cyber threats.
4. "Security experts warn chemical plants are vulnerable to cyber-attacks", Chemistry World, available at <http://www.rsc.org/chemistryworld/2015/06/chemical-plants-vulnerable-cyber-attacks>
5. "The Nitro Attacks Stealing Secrets from the Chemical Industry", Symantec Security Response, available at [https://www.symantec.com/content/en/us/enterprise/media/security\\_response/whitepapers/the\\_nitro\\_attacks.pdf](https://www.symantec.com/content/en/us/enterprise/media/security_response/whitepapers/the_nitro_attacks.pdf)
6. Toxic industrial chemicals are industrial chemicals that are manufactured, stored, transported, and used throughout the world. Toxic industrial chemicals can be in the gas, liquid, or solid state. They can be chemical hazards (e.g., carcinogens, reproductive hazards, corrosives, or agents that affect the lungs or blood) or physical hazards (e.g., flammable, combustible, explosive, or reactive), see "Toxic Industrial Chemicals (TICs) Guide", United States Department of Labor, available at <https://www.osha.gov/SLTC/emergencypreparedness/guides/chemical.html>.
7. Ammonia is essential to fertilizer production, and used widely in pharmaceuticals. Phosgene is used in plastics and the pesticides industry.

Chlorine has its applications in making plastics, solvents, textiles, agrochemicals and insecticides.

8. "Cyanide", available at <http://fas.org/nuke/guide/usa/doctrine/army/mmcch/Cyanide.htm> and "Facts About Phosgene", Center for Disease Control and Prevention, available at <http://emergency.cdc.gov/agent/phosgene/basics/facts.asp>
9. *ibid.* 3.

# Chemical and Biological News

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## DISARMAMENT

### OPCW Director-General Visits Russia to Mark Closure of Maradykovsky Chemical Weapons Destruction Facility

Friday, October 30, 2015

At the invitation of the Government of the Russian Federation, OPCW Director-General Ahmet Üzümcü participated today in a ceremony marking the completion of operations at the Maradykovsky Chemical Weapons Destruction Facility in the Kirov region.

"The legacy of the Russian Federation's chemical weapons destruction programme will be judged favourably by history," said Ambassador Üzümcü in his remarks [PDF, 207KB] at the ceremony. "For it is a legacy that demonstrates how collective imagination and political will can rid the world of some of the most deadly weapons ever created."

Ambassador Üzümcü acknowledged the efforts of the Russian Government to destroy its stockpile in a safe and efficient manner. He also recognised the important financial and in-kind contributions made by other OPCW Member States in support of these efforts.

During his visit, the Director-General met with the Chairman of the State Commission on Chemical Disarmament, Plenipotentiary Envoy of the Russian President for the Volga Federal District, Mr Mikhail Babich. They reviewed matters related to the destruction of Russian Federation's chemical weapons; the implementation of the Convention globally, including progress made towards its universal acceptance, as well as OPCW's

work in the Syrian Arab Republic. Mr Babich and the Director-General elaborated their concerns in the context of the prevention of the acquisition and the use of chemical weapons by non-state actors.

Maradykovsky is one among the four destruction facilities to complete operations in the Russian Federation this year. The three other facilities - Leonidovka, Pochev and Shchuchye - close this year.

Russia has so far destroyed 92% of its declared stockpile and is expected to complete operations at its one remaining chemical weapons destruction facility at Kizner by December 2020

<https://www.opcw.org/news/article/opcw-director-general-visits-russia-to-mark-closure-of-maradykovsky-chemical-weapons-destruction-facility/>

### OPCW reaches three thousand industry inspections milestone

Friday, August 21, 2015

The Organisation for the Prohibition of Chemical Weapons (OPCW) today completed four chemical industry inspections in different geographic regions of the world, bringing the total number of such inspections to three thousand.

The inspections confirmed that the activities in those sites were in compliance with the Chemical Weapons Convention (CWC).

The Director-General of the OPCW Ambassador Ahmet Üzümcü underlined: "Chemical industry verification is one of the pillars of the CWC. The successful completion of 3000 inspections strengthens our resolve to ensure that chemical weapons are never again produced or used. We recognise the key importance of the cooperation of the

global chemical industry in achieving this aim.”

The aim of chemical industry inspections is to promote confidence that all members are complying with their obligation to prevent the re-emergence of chemical weapons. During their missions, OPCW's inspectors verify that no chemicals or their precursors covered under the CWC are being produced or used for prohibited purposes.

Out of 191 States Parties to the CWC, over 80 States possess chemical industry facilities which fall under the OPCW's verification regime. Each year, the OPCW conducts 241 industry inspections worldwide in such facilities.

<https://www.opcw.org/news/article/opcw-reaches-three-thousand-industry-inspections-milestone/>

## **NATIONAL AND INTERNATIONAL DEVELOPMENTS**

### **French army guards water facilities as France's fears of a CHEMICAL ATTACK intensify**

By Selina Sykes

Saturday, November 21, 2015

The precautions come after French Prime Minister Manuel Valls warned jihadis could use chemical and biological weapons in an assault against France.

Fears of biological warfare were raised after 12 protective suits used to protect people from chemical products and contaminative viruses such as Ebola were stolen from a Parisian hospital.

More than 30 protective boots made of chemical-resistant polyethylene along with

gloves and anti-bacterial masks have also disappeared.

A spokesman for Necker hospital in southwest Paris said: “The disappearance of this limited amount of equipment was noticed on Wednesday and a complaint has been filed.”

The revelation comes as Belgian capital Brussels heightened its terror alert to the maximum level amid fears of a Paris-style attack.

Dangerous chemicals were also discovered among “an arsenal” of weapons in a flat that was raided today in Brussels district Molenbeek.

The disappearance of this limited amount of equipment was noticed on Wednesday. A spokesman for Necker hospital.

Several members of the band of jihadis that unleashed terror across Paris last Friday night were from the troubled Belgian suburb - which has dubbed as Europe's hotbed of Islamic extremism.

Eau de Paris (Paris Water), the capital's state-run water company, has banned access to six vital facilities to all but key personnel.

A spokesman said: “Our eight security agents are the only ones to be accredited by the Ministry of Defence and are in permanent contact with the terrorism cell of Paris police headquarters.”

Troops are currently stationed around protective fences at water storage plants - which are equipped with sensors used to detect intruders.

Eau de Paris has also increased the amount of chlorine added to water at five key supply sites.

The water company spokesman said: “The water is always chlorinated for health

reasons, but the dose injected has been raised. When the chlorine level drops, it means there is biological contamination."

Hospitals and emergency services across France have been supplied with the antidote to Sarin - an extremely potent chemical weapon - and other nerve gas chemicals for the first time.

The Army's medical service was also ordered to distribute stocks of the drug Atropine which is used to treat poisonings.

France has declared a three-month state of emergency following the deadly attacks in its capital committed by terrorists armed with suicide belts and Kalashnikovs.

French authorities said police have so far conducted 793 raids after Friday's atrocities in an unprecedented crackdown on terror.

Last night alone police performed 182 raids - detaining 17 people and seizing 76 weapons as well as drugs.

After five nights of relentless raids French police have detained 90 people and seized 174 weapons - including 18 military-style firearms, 84 rifles and 68 handguns.

A total of 164 people have been placed under house arrest under new powers permitted under France's state of emergency and 250,000 euros have also been seized.

<http://www.express.co.uk/news/world/621076/French-army-guards-water-facilities-Paris-attacks-France-risks-chemical-war>

## **New Report of ISIS Using Poison Gas in Syria**

By Karam Shoumali and Ceylan Yeginsu  
August 24, 2015

ISTANBUL - The Islamic State may have used chemical agents in an attack against

civilians and rival insurgents in northern Syria late last week, according to local rebels and an international aid group.

The assault on Friday in the city of Marea involved more than 50 shells and was centered on civilian areas, the Syrian American Medical Society, a humanitarian group, reported.

After the attack, the group's field hospital received more than 50 patients, 23 of whom, including some children, showed symptoms of chemical exposure, including coughing, vomiting, wheezing and severe itching. Some also had blisters associated with mustard gas, the society said in a statement.

The report was corroborated by local rebel forces, who claimed that shells had been fired from Isnibil, a village east of Marea that is controlled by the Islamic State, also known as ISIS or ISIL.

"At least half of the 50 mortar and artillery shells fired by ISIS contained poisonous mustard gas," said Hussein Nasir, a spokesman for a Syrian rebel group, the Shami Front.

He said that his group had consulted a general who defected from the Syrian Army and was familiar with chemical weapons. After hearing accounts of the attack and seeing videos and photographs of the shells, the general concluded that some of the shells contained mustard gas, Mr. Nasir said.

This month, the Pentagon said the Islamic State was suspected of using chemical agents in an attack against Kurdish forces in northern Syria. American officials said they were also looking into reports of a mustard gas attack on Kurdish fighters in Makhmur, Iraq.

"The shells landed randomly on different parts of the city resulting in many injuries,"

Mr. Nasir said of the attack on Friday. "Some bad odor filled the air, and those who were exposed showed symptoms of suffocation, skin irritation and swelling."

When the shells hit, opponents of the Syrian government of President Bashar al-Assad were commemorating the second anniversary of a chemical weapons attack on a Damascus suburb carried out by the government.

A nurse at the field hospital run by the Syrian American Medical Society said he had noticed a strange odor on the clothes of the victims.

"We received a family in very bad condition - two parents and a child," the nurse, Tariq Najjar, said. "They had difficulty breathing, severe headaches, a running nose, skin irritation and red teary eyes."

He said that five more shells were fired on Saturday.

One person was killed in the attack, but apparently by conventional ordnance, not chemical agents, the rebels said. The medical society said in a statement that there had been no deaths from chemical agents.

Marea links the much larger city of Aleppo to the Turkish border, and it is a crucial strategic prize for the Islamic State; many of its residents have fled the fighting.

The city has long been held by insurgents, who initially took up arms against Mr. Assad's government but have also clashed with the Islamic State. Marea was one of the first strongholds of the rebel forces that were then made up of army defectors and townspeople.

Correction: August 24, 2015

An earlier version of this article referred incorrectly to a nurse at a hospital run by

the Syrian American Medical Society. The nurse, Tariq Najjar, is a man.

[http://www.nytimes.com/2015/08/25/world/middleeast/isis-suspected-of-chemical-attack-in-syria.html?ref=topics&\\_r=0](http://www.nytimes.com/2015/08/25/world/middleeast/isis-suspected-of-chemical-attack-in-syria.html?ref=topics&_r=0)

#### **4 Pentagon Labs Face Inquiry on Handling of Deadly Germs**

By Denise Grady September 11, 2015

The Centers for Disease Control and Prevention is investigating four Defense Department labs for mishandling deadly germs used in bioterrorism research, a spokesman said Friday.

The mistakes involve anthrax, plague and viruses that cause encephalitis, which are studied by the military to defend against their potential use as biological weapons. There is no evidence that anyone has been harmed by the errors or that there is any risk to the public, officials say. But bioterrorism experts say that there should be zero tolerance because the organisms are so dangerous, and that even seemingly small mistakes, like flaws in record-keeping, could have calamitous results.

Because of the C.D.C. findings, the secretary of the Army on Sept. 2 ordered the four labs to suspend their work with certain dangerous microbes classified as "select agents" because of the risks that they pose. The suspension was first reported by USA Today. The laboratories are the Dugway Proving Ground Life Sciences Test Facility in Utah, and three sites in Maryland: the Edgewood Chemical and Biological Center, the U.S. Army Medical Research Institute of Infectious Diseases and the Naval Medical Research Center. They, along with five other labs, have been ordered to conduct safety reviews of all their procedures.

Concerns about the military labs surfaced in May, when it was discovered that the Dugway lab had, during the past decade, mistakenly shipped live anthrax - the bacteria were supposed to have been killed - to numerous labs in the United States and seven other countries.

The Dugway incident led the C.D.C. to conduct spot checks at other Defense Department labs, said a spokesman for the agency, Jason McDonald. Six inspectors were sent to the Edgewood facility from Aug. 17 through 19.

"Inspectors found some labeling issues," Mr. McDonald said. He said questions were raised about whether certain specimens labeled killed and harmless might actually contain live organisms. For instance, the inspectors found two vials of plague bacteria outside the safe containment area designated for live organisms, and when they asked for documentation to determine whether the bacteria were live or inactivated, "two documents provided showed discrepant results for the same product," Mr. McDonald said in an email.

Questions were also raised about whether active encephalitis viruses might have been shipped as if they were harmless, but a preliminary investigation suggests that was not the case, Mr. McDonald said. But he added that there were "preliminary indications" that other specimens of dangerous organisms may have been shipped without proper authorization.

"C.D.C. is investigating those transfers to ensure that there was no risk to those that handled this material or to the public," Mr. McDonald said.

The C.D.C. was not granting interviews with the scientists who conducted the inspections because the investigation is still going on, Mr. McDonald said.

In an email, he said the agencies' responses 'demonstrate how seriously both organizations take incidents involving select agents. We accept there will always be some risk in the laboratory work C.D.C. and others do to protect Americans, but our goal is to eliminate unnecessary risk and reduce unavoidable risk. That is why labs in the select agent program have numerous, redundant systems to ensure there are many layers of protection between the work done in labs and the general public."

When asked for comment, the Pentagon provided only its statement from Sept. 2.

<http://www.nytimes.com/2015/09/12/health/4-pentagon-labs-face-inquiry-on-handling-of-deadly-germs.html?ref=topics>

### **Iraq: Monitoring Group to Investigate Possible Chemical Weapons Use by ISIS**

By Rick Gladstone August 17, 2015

The group responsible for monitoring adherence to the global ban on chemical weapons said Monday that it had contacted Iraq over reports of the possible use of such munitions there. A statement by the group, the Organization for the Prohibition of Chemical Weapons, based in The Hague, came a few days after United States officials said Islamic State militants appeared to have used such munitions, possibly mustard gas, on Kurdish fighters in Iraq. If confirmed, it would be the first known use of the weapons by the Islamic State, which occupies parts of Syria and Iraq. The monitoring group called such reports "a matter of serious concern," and its director, Ahmet Uzumcu, said it would "examine any substantive reports it receives including pertinent information that might be shared" by other signers of the chemical weapons ban, which appeared to be a reference to both Iraq and Syria. Iraq,

where hundreds of old, corroded mustard artillery shells remained after the 2003 American invasion, signed the chemical weapons ban in 2009. Syria joined in 2013 after having promised to destroy its chemical stockpile, although the monitoring organization said this year that chlorine bombs had been used in the Syrian conflict. On Aug. 7, the United Nations Security Council passed a resolution authorizing an inquiry into who was responsible for the chlorine attacks.

<http://www.nytimes.com/2015/08/18/world/middleeast/iraq-monitoring-group-to-investigate-possible-chemical-weapons-use-by-isis.html?ref=topics>

## **ISIS Is Suspected of a Chemical Attack Against Kurds in Syria**

By Helene Cooper August 14, 2015

WASHINGTON - The Islamic State is suspected of using chemical agents - said by some American officials to be mustard gas - in an attack on Kurdish fighters in northern Syria two weeks ago, United States officials said Friday.

If authenticated, the chemical attack would be an escalation of the more than yearlong conflict underway in Iraq and Syria, and could increase pressure on the Obama administration to intervene more forcefully in the war against the Sunni militant group.

The Pentagon said Friday that it also was looking into reports of another possible mustard gas attack this week on Kurdish fighters - this one in Makhmur, Iraq. Kurdish news media reports on Thursday quoted local officials saying that mortar rounds fired at Kurdish positions in Makhmur may have contained mustard gas because the wounds to injured pesh merga fighters were different from those in a conventional attack.

"We've seen those reports and we're taking them seriously," Col. Patrick S. Ryder, a spokesman for the United States Central Command, said in a telephone briefing with reporters Friday. He added, "At this point, we really don't know what, if anything, may have been used."

Colonel Ryder declined to say whether the United States has sent independent inspectors to verify the attacks.

The question is complicated by history. Kurds have suffered chemical attacks in the past, but since 2002 various Kurdish officials seeking Western support have highlighted stories of chemical attacks and chemical weapons stocks that were never confirmed.

But on Friday two American officials said the defense and intelligence community had come to believe that mustard gas was used two weeks ago in the northern Syria attack, which injured several Kurdish fighters.

That view, one official said, had prompted assessments that the Makhmur report this week was "plausible."

The Kurdish claims were not independently verifiable, and further details of the purported attacks were scarce.

At least hundreds of old and often corroded mustard artillery shells remained in Iraq after the United States invaded in 2003. By 2004, Sunni insurgents had begun occasionally using the shells in improvised bombs against American forces.

But Kurdish claims of mortar shells containing mustard gas being fired, as opposed to being used in hidden explosives, were new and do not match past insurgent patterns.

On Thursday, the Kurdish news media outlet Rudaw quoted a Kurdish commander,

Muhammad Khoshawi, as saying that on Wednesday night "at least 45 mortar rounds were fired at our positions, which we believe were loaded with chemicals, since the wounds are different." He said that evidence had been sent for examination, but that there were no conclusive results.

The attack this week in which the Islamic State may have used mustard gas was first reported by The Wall Street Journal.

For President Obama, a confirmed use of chemical weapons by the Islamic State could increase the pressure for him to move more forcefully against the militant group.

The newest reports also come as Mr. Obama's success in forcing President Bashar al-Assad of Syria to renounce his chemical weapons and turn that arsenal over to the West for destruction is coming under assault.

There have been reports this year of chemical weapons being used in Syria, both by the Assad government and by the Islamic State. Earlier this year there were reports that the Syrian government had bombarded areas held by insurgents with chlorine-filled barrel bombs. Unlike mustard gas, chlorine was not banned under a Russian-American agreement with Syria to remove and destroy its chemical weapons. But it is barred by international convention.

Administration officials said Friday that they believed the Islamic State had several times used chlorine gas against Kurdish fighters.

The president has been loath to commit American ground troops to fight the Islamic State, and the introduction of chemical weapons to the battlefield may only reinforce that reluctance inside the White House, one administration official said Friday.

While Mr. Obama has been willing to authorize airstrikes against the Islamic State,

an enemy of Syria and the United States, he has resisted becoming directly involved in the fight to topple Mr. Assad's government.

But Mr. Obama has said that the use of chemical weapons would cross a red line that could force American action.

<http://www.nytimes.com/2015/08/15/world/middleeast/isis-suspected-of-chemical-attack-against-kurds-in-syria.html?ref=topics>

## **Did North Korea Really Publish Pictures of a Biological Weapons Facility?**

By Avi Asher-Schapiro

July 9, 2015

North Korea might have just revealed that it has the capability to produce massive quantities of biological weapons.

On June 6, a North Korean scientist defected to Finland with 15 gigabytes of electronic evidence that he claims documents how the country is testing chemical and biological agents on its own citizens.

That same day, North Korea's state media released photos of Kim Jong-un touring what it described as a pesticide factory called the Pyongyang Bio-technical Institute - but experts tell VICE News that this same facility is likely meant to produce massive quantities of weaponized anthrax.

Melissa Hanham, a senior research associate at the James Martin Center for Nonproliferation Studies, first discovered the significance of the photos. She provided VICE News with an advance copy of her analysis of the images, released today, in which she concludes that, "given North Korea's known history of interest in biological weapons, it is hard to avoid the conclusion that the Institute is intended to produce military-size batches of anthrax."

The multi-million dollar facility is ostensibly intended to produce bacillus thuringiensis (Bt), a bacteria commonly used for pesticides.

'They messed up.' "If you're a biological weapons expert, and see a facility for bio-pesticide, you immediately ask yourself: what kind?" Hanham said. "Then when you see packages of Bt, you should know that it's a close cousin of anthrax - it's produced the exact same way."

The Pyongyang Bio-Institute was constructed between 2010 and 2011 and is run by Korean People's Army Unit 810. Pictures of the equipment published by North Korean press reveal nearly all the necessary components of a biological weapons program: incubators to grow bacteria, ventilation hoods to safely handle biohazards, fermenters and bioreactors used to grow bacteria, and a spray dryer to transform spores into a fine powder.

"They messed up," Joel S. Wit, a former State Department official and a senior fellow at the US-Korea Institute at Johns Hopkins University, told VICE News. "If you're a technical expert, it's clear looking at this facility that it can be used for biological warfare, particularly anthrax. The science is not in dispute."

An independent expert on North Korean military capabilities confirmed to VICE News that the photos most likely show an operational biological weapons facility.

Pesticide production is "an old and well-used cover for a biological weapons program," Hanham explained. Iraq and the USSR both created dual-use facilities that were used to make pesticides and biological weapons.

Hanham noted that even if the facility is used to produce the pesticide, "in one day it could

be converted to an anthrax facility. All you have to do is sterilize the equipment."

The facility might have been developed with help from a foreign agricultural aid organization. In 2005, with funding from the Swiss Agency for Development and Cooperation and Chinese equipment, the UK non-profit CABI helped North Korea establish a pilot facility at the country's Plant Protection Institute, located nine miles away from the alleged bioweapons facility, where it trained North Korean scientists in the production of Bt pesticide. The institute "was likely a training ground in preparation for the large-scale facility that Kim Jong-un toured," Hanham writes in her report.

"Teaching how to make Bt is essentially the same as teaching how to make anthrax," she said.

She stressed that she does not think that CABI knowingly aided the development of North Korea's bioweapons program. CABI did not respond to requests from VICE News for comment.

"The problem here is you have tech that can be used for civilian and military purposes," Wit explained. "It's clear that more vigilance is necessary in the future."

Experts told VICE News that the Pyongyang Bio-Institute likely represents the most revealing glimpse into North Korea's bioweapons capabilities that has been made public - but noted that it remains unclear how the facility fits into North Korea's overall program.

"It's similar to their nuclear weapons programs," Wit said. "We can't prove they are doing it, but looking at the facilities, we can make a judgment. That's what this is about."

"Very little is known about the origin of capability of North Korea's biological program," said Hanham.

Though many experts believe that the country acquired a sample of anthrax and other epidemiological bacteria from Japan in 1968, it's impossible to verify that it has actually developed a stockpile of the toxic agent. A South Korean government white paper published in 2012 suggested that North Korea is capable of producing a variety of biological weapons, "including anthrax, smallpox, pest, francisella tularensis, and hemorrhagic fever virus."

It's also difficult to assess to what degree North Korea might be in violation of international protocols that regulate the equipment used to make biological weapons, such as the Biological and Toxin Weapons Convention, to which it is a signatory. But the production of anthrax is not technically banned - the US and its allies regularly produce anthrax for research purposes. A violation occurs only if the agent is stockpiled and intended for military use.

A group of 41 countries known as the Australia Group also regulates the export of equipment that can be used to make biological agents.

"There's a very complicated network of rules and regulations around bio-weapons," Hanham said. "It's very hard for me to say definitely if a violation has occurred. We don't know where all this equipment came from, and when it arrived in North Korea."

Nevertheless, she insists the size of the facility should be cause for serious alarm.

"It's not the biggest in the world, but it's still pretty large," she said. "I've never seen images like these published before."

<https://news.vice.com/article/did-north-korea-really-publish-pictures-of-a-biological-weapons-facility>

## **The Troubling Truth Behind ISIS Chemical Weapons Claims A psychological game changer, or business as usual for the brutal extremist force?**

By Paul D. Shinkman August 14, 2015

The Islamic State group reportedly has launched a chemical weapons attack against a group of Kurdish fighters, raising disturbing questions about how the group obtained the chilling weapon.

A report in the Wall Street Journal cited a German Defense Ministry official who said a mustard gas attack took place on roughly 60 Kurdish fighters in an area 40 miles southwest of Irbil, the capital of Iraq's ethnic Kurd region. A group of Western specialists is reportedly investigating the incident.

The Pentagon has so far refused to publicly confirm the statements from unnamed defense sources who also spoke with the Journal. When asked on Friday, a spokesman for the war effort against the Islamic State group said the Defense Department is currently looking into the reports.

"At this point, we really don't know what if anything may have been used, so I'm not going to speculate on what that is," Air Force Col. Pat Ryder, with U.S. Central Command, told reporters by phone from a base in Southwest Asia.

The Islamic State group, like other terrorist organizations is trying to get chemical weapons, he said, but declined to specify on whether they do now or ever have. Ryder also declined to say whether the report had at all affected war plans against the

extremist force, or whether allied ground forces such as the Kurds or the Iraqi army are readily equipped to protect themselves against chemical weapons.

(The U.S. military has developed both protective gear and inoculations it can issue to troops to defend against a weapon like mustard gas.)

However, the use of chemical or biological weapons defies international norms and serves as “just another example of the kind of enemy we’re dealing with here,” Ryader said. “They have clearly demonstrated they are a barbaric, inhumane enemy. Of course we take threats seriously but in terms of the use of chemical weapons, that’s something we’re looking into.”

Indeed, the Islamic State group once again seized headlines earlier this week after reports of its brutal use of rape and sexual slavery to punish what it considers non-believers. A feature in The New York Times quoted a 12-year-old Iraqi Yazidi girl who claimed an Islamic State group fighter told her before raping her that the assault brought him “closer to God.”

The reports of chemical weapons use may also be a propaganda move to instill fear in the extremist network’s greatest foes. But for the Islamic State group, the news also serves as a further reminder that its campaign based on torture, rape and murder exists in a region already plagued by violence and despair.

“Nothing shocks the conscience anymore with a group that has burned people alive and drowned them, and taped it,” says Colin Clarke, a chemical weapons expert and political scientist with the Rand Corp. “It doesn’t surprise me. In fact I’m more surprised it took this long.”

The chief questions now facing Western war planners center on how much of the chemicals the Islamic State group could have and where it may have gotten them, says Kingston Reif, director of disarmament and threat reduction policy at the Arms Control Association. Their use, however, is likely more for psychological effect.

“At this point, it doesn’t appear that whatever chemicals ISIS might have poses a larger strategic threat to the region, or provides them with a decisive game-changer on the battlefield,” he says.

The recent history of the region documents a troubling story of deadly proliferation.

The regime of Iraqi dictator Saddam Hussein notoriously deployed mustard gas - a weaponized chemical most commonly known for its use in World War I that causes severe skin blistering - against the Kurds in 1983, and the nerve gas Tabun beginning in 1985. Syrian President Bashar Assad admitted in recent years that his regime had developed advanced stockpiles of chemical weapons, including VX and mustard gas. Neither regime is believed to have kept fastidious records of the size and scope of its chemical weapons program, which may have been more extensive than each of the leaders knew in detail.

A U.S. diplomatic effort led to the removal and destruction of the declared Syrian stockpiles, ending roughly this time last year. The completion of that task gave way almost immediately to concerns that some undeclared stockpiles may remain in Syria, and amid the rise of the Islamic State group, may fall into dangerous hands.

“We continue to have concerns about the discrepancies between our knowledge of the Syrian chemical weapons program and the declarations submitted by the Syrian

government," the National Security Council's top officer for weapons of mass destruction, Laura Holgate, said last September. "We've seen an uptick in interest in [chemical weapons] among terrorist groups, some associated with fighters in Syria."

It remains unconfirmed that the Islamic State group has mustard gas or any other form of chemical weapon or that it has used them. But it has overrun numerous Syrian military facilities, whose contents are still unknown to its Western opponents.

It's also possible, though unlikely, that the extremist network was able to smuggle in chemical weapons from outside its established territory in Syria and Iraq, or that chemists within its ranks could create their own. The proliferation of such weapons throughout those two countries in recent history, however, combined with the relatively small size of the reported attack indicates the toxins are likely local.

*<http://www.usnews.com/news/articles/2015/08/14/the-troubling-truth-behind-isis-chemical-weapons-claims>*

## **Claims of Syrian Chlorine Bombs Counter News of Progress on Chemical Arms**

By Rick Gladstone June 17, 2015

The monitoring group overseeing the destruction of Syria's chemical arms stockpile said Wednesday that almost all effluent from the neutralized weapons had been eliminated, portraying the progress as a great success in the nearly two years since Syria agreed to give up its arsenal.

But the news from the group, the Organization for the Prohibition of Chemical Weapons, was partly overshadowed by

outrage over what critics of the Syrian government call its increasingly brazen use of chlorine in makeshift poison gas bombs dumped on civilians and suspected rebels in the civil war.

Witnesses at a House Foreign Affairs Committee hearing in Washington, including a Syrian doctor and a civil defense coordinator from areas said to have been attacked, described the chlorine bombs as horrific weapons that had asphyxiated young children.

One witness, Dr. Annie Sparrow, a pediatrician and human rights activist who has helped train doctors working in rebel-held areas of Syria, accused the Syrian government not only of using chlorine in bombs, but also of withholding chlorine for water purification and other critical sanitation needs in areas it does not control.

Dr. Sparrow, an outspoken critic of the Syrian government, said it had "transformed a principal element of public health into a tool of disease and terror."

President Bashar al-Assad of Syria denies that his forces have dropped chlorine bombs, which would be a war crime. Such attacks would also violate the Chemical Weapons Convention, which the Syrian government, under heavy pressure from Russia, signed in 2013 to avert an attack threatened by the United States.

But there is substantial evidence of what Mr. Assad's opponents describe as at least 29 chlorine bomb attacks launched from government helicopters in rebel-held parts of northern Syria this year. In March, the United Nations Security Council passed a resolution condemning them, without ascribing responsibility.

Samantha Power, the American ambassador to the United Nations, has repeatedly

warned that those responsible for chlorine bomb attacks will be held accountable. But it remains unclear when, or even whether, the Security Council will take more decisive action.

The question of an international response to the chlorine attacks has been further complicated by recent evidence suggesting that Mr. Assad secretly withheld some banned chemical compounds from destruction.

Domestic critics of President Obama, who once declared that chemical weapons use in Syria would violate his "red line" and would force American action, have called his response far too tentative - an accusation his aides strongly deny.

"Assad has seen the world's complacency and decided that he can literally get away with murder," said Representative Ed Royce, a California Republican and the chairman of the Foreign Affairs Committee.

Chlorine is considered a dual-use chemical, with many important industrial and hygienic applications in addition to its capacity as a weapon. It is not on the list of toxic substances, including nerve agent ingredients and mustard gas, that Mr. Assad was required to give up when Syria acceded to the Chemical Weapons Convention banning them.

The Organization for the Prohibition of Chemical Weapons, which oversees compliance with the treaty, said nothing about chlorine in its announcement on Wednesday, which was devoted to updates on the elimination of Syria's banned chemical munitions.

It said effluents created aboard the Cape Ray - the American naval vessel that neutralized 600 tons of Syrian toxic

materials, including sulfur mustard and DF, a precursor chemical to nerve agents - were destroyed at facilities in Germany and Finland last week.

"This is yet another milestone in the path to eliminating chemical weapons stocks from Syria," the monitoring organization's director general, Ahmet Uzumcu, said in the announcement.

Of the entire 1,300-ton Syrian stockpile, the organization said, 16 tons of hydrogen fluoride remain to be destroyed at a facility in Port Arthur, Tex.

*<http://www.nytimes.com/2015/06/18/world/middleeast/claims-of-syrian-chlorine-bombs-counter-news-of-progress-on-chemical-arms.html?ref=topics>*

## **OPCW Director-General Visits Germany**

Thursday, October 22, 2015

The Director-General of the Organisation for the Prohibition of Chemical Weapons (OPCW), Ambassador Ahmet Üzümcü delivered a key note address at the opening of the Third International Symposium on Development of Chemical, Biological, Radiological and Nuclear (CBRN) Defence Capabilities in Berlin, Germany on 20 October 2015. In his speech, he underlined the need for concerted action to address the serious threat of the use of chemical weapons by non-state actors.

The Director-General stated that the world community is facing the time "when extremists are alleged to have developed and used chemical weapons to tragic effect". He noted that "[w]hen it comes to chemical weapons, non-state actors do not constrain themselves to the same taboos and norms that States do." To meet this challenge, the

OPCW Director-General recommended a focussed attention on three areas: limiting the permissive operating environment for those who wish to fabricate or use chemical weapons; strengthening chemical safety and security; and involving international organisations in combating this threat adding that "It is my firm conviction that realising a world free of chemical weapons will not be possible if we do not cooperate with one another."

During the visit to Berlin, the OPCW Director-General met senior government officials that included Dr Katrin Suder, State Secretary at the Federal Ministry of Defence; Dr Markus Ederer, State Secretary of the Federal Foreign Office; Dr Christoph Heusgen, Director General of Foreign and Security Development Policy, Federal Chancery; Dr Patricia Flor, Federal Government Commissioner for Disarmament and Arms Control, and other senior officials from the Ministry of Defence, Ministry of Foreign Affairs and the German National Authority for the Chemical Weapons Convention (CWC). The Director-General also visited the Bundestag where he met with Dr Ute Finckh-Krämer, SPD, and Dr Karl-Heinz Brunner, SPD, of the Bundestag Subcommittee on Disarmament.

In the meetings the Director-General discussed the progress made towards the implementation of the CWC and the current status of the OPCW's work to eliminate Syria's chemical weapons programme. Ambassador Üzümcü expressed appreciation to the German Government for its significant contribution to the Syria mission as well as the strong support that Germany provides to the Organisation's work.

<https://www.opcw.org/news/article/opcw-director-general-visits-germany/>

## **The 16th Annual Associate Programme Begins**

Monday, July 27, 2015

The OPCW officially commenced the 16th edition of its annual Associate Programme on 24 July at the organisation's headquarters in The Hague. Launched by the OPCW in 2000, the programme trains chemists and chemical engineers in the peaceful uses of chemistry and provides in-depth understanding of the Chemical Weapons Convention (CWC) and of the OPCW, thereby enhancing States Parties' capacity to implement the CWC at the national level. It has steadily grown into a major international training programme that directly contributes to the economic and technological development of States Parties as stipulated by Article XI of the CWC.

OPCW's Deputy Director-General, Mr. Hamid Ali Rao, chaired the opening session on behalf of the Director-General and addressed the participants. He expressed appreciation to States Parties for their continuing support to the programme and for the support of various other partners, including the World Customs Organization (WCO), European Chemical Industry Council (CEFIC), European Association of Chemical Distributors (FECC), European Chemicals Agency (ECHA), Dutch Customs Authorities, City and Port of Rotterdam, and Technical University of Delft.

This year's 10-week course has 32 Associates from 30 countries\*, who will participate in lectures and exercises at the OPCW headquarters, visit specialised institutions in the Netherlands and attend a three-week "Chemical Engineering-Oriented Skills Development Course" at the University of Surrey, UK. The Associates will then attend a one-week training on Chemical Safety and Security in The Hague before departing for

three weeks on industry attachments hosted by chemical industries in Brazil, Croatia, Denmark, Germany, Italy, Japan, Malaysia, the Netherlands, Poland, Saudi Arabia, Spain and Sri Lanka. This on-the-job experience provides skills to operate in a modern chemical industry with an emphasis on chemical process safety management.

\*Algeria; Argentina; Brazil; Burkina Faso; Burundi; Cameroon; China; Colombia; Cuba; Ethiopia; Ghana; Hungary; India; Jordan; Kenya; Lesotho; Malawi; Nigeria; Pakistan; Paraguay; Philippines; Poland; Saudi Arabia; Spain; Sri Lanka; Sudan; Tanzania; Tunisia; Uganda; Zimbabwe

<https://www.opcw.org/news/article/the-16th-annual-associate-programme-begins/>

## UNIVERSALITY

### **Angola Joins the Organisation for the Prohibition of Chemical Weapons**

Friday, October 16, 2015

Angola has today become a State Party to the Chemical Weapons Convention, bringing the total number of OPCW Member States to 192.

"Angola's accession to the Convention brings this important treaty a further step towards complete universality," said Ambassador Ahmet Üzümcü, Director-General of the OPCW. "I hope this will encourage those countries which remain outside the Convention to join the global consensus against chemical weapons."

Angola deposited its instrument of accession on 16 September 2015 and the Convention entered into force for it on 16 October 2015.

Non-States Parties to the Chemical Weapons Convention include South Sudan, Egypt, Israel and North Korea.

<https://www.opcw.org/news/article/angola-joins-the-organisation-for-the-prohibition-of-chemical-weapons/>

### **Myanmar joins the Organisation for the Prohibition of Chemical Weapons**

Friday, August 07 , 2015

Myanmar today became the 191st State Party to the Chemical Weapons Convention (CWC), as the Convention entered into force for the country.

"Myanmar's accession brings the CWC closer to universal adherence and to achieving a world free of chemical weapons. The Convention continues to be the singular multilateral instrument for chemical disarmament, and its universal acceptance is an absolute priority for the OPCW. It is essential that the States still outside the CWC join as soon as possible," said the OPCW Director-General, Ambassador Ahmet Üzümcü.

The number of States not Party to the Convention is now reduced to five, namely Angola, Egypt, Israel, North Korea and South Sudan.

Myanmar deposited its instrument of ratification to the CWC on 8 July 2015, with the Convention entering into force 30 days following this step.

<https://www.opcw.org/news/article/myanmar-joins-the-organisation-for-the-prohibition-of-chemical-weapons/>

## Myanmar Signs Treaty on Chemical Weapons

July 9, 2015

Myanmar, a former pariah state in Southeast Asia once run by a military junta that has gradually embraced some democratic changes and reintegration with the world, has become the 191st country to sign the treaty that bans chemical weapons, the international body that monitors that accord said Thursday.

The body, the Organization for the Prohibition of Chemical Weapons, said in a statement that Foreign Minister Wunna Maung Lwin had pledged to help "bring about a world completely free of chemical weapons."

With Myanmar's membership in the treaty, known as the Chemical Weapons Convention, only five countries remain outside it: Angola, Egypt, Israel, North Korea and South Sudan.

Myanmar's government has taken cautious steps to create more civilian control, but the military remains ensconced as an authority.

<http://www.nytimes.com/2015/07/10/world/asia/myanmar-signs-treaty-on-chemical-weapons.html?ref=topics>

## NEW DEVELOPMENTS IN SCIENCE AND TECHNOLOGY

### U.N. Security Council Adopts Measure to Identify Chlorine Bomb Users in Syria

By Rick Gladstone August 7, 2015

The United Nations Security Council took a major step on Friday in holding chemical weapons users in the Syria war accountable, adopting a resolution to create an investigating panel to identify them.

The resolution, drafted by the United States after an unusual collaboration with Russia on the text, was passed unanimously by the 15-member Council.

It represents the most significant action by the Council on the chemical weapons issue in Syria since President Bashar al-Assad's government first pledged nearly two years ago, under American and Russian pressure, to purge its stockpile of the munitions and join the treaty that bans them.

Despite that pledge, and the verified destruction of all 1,300 tons of the Syrian government's declared chemical arsenal under international supervision, the number of bomb attacks suspected of involving chlorine has been growing in the war, now in its fifth year.

While chlorine, a common chemical, is not among the banned substances that Syria was required to purge, its use as a weapon is still prohibited under the treaty and considered a war crime.

Until now, no measure undertaken by the Security Council had provided a means to attribute responsibility for chemical weapons attacks.

The Organization for the Prohibition of Chemical Weapons, the group based in The Hague that polices the treaty, said early this year that it was confident that deadly chlorine-filled bombs had been used in the Syrian conflict. While it was not authorized to ascribe blame, the group's reporting quoted witnesses as saying the weapons were dropped by helicopters, which only the Syrian government possesses.

The United States has repeatedly accused Mr. Assad's forces of responsibility for these attacks, while Russia, an ally of the Syrian government, has been far more skeptical. Mr. Assad has denied any responsibility.

The resolution, which the Americans have been working on for months, represents a rare instance of cooperation by the United States and Russia. They have differed bitterly over the causes of the Syrian conflict and how to end it, but they share an opposition to the use of chemical weapons.

The scheduling of the vote followed an announcement by Secretary of State John Kerry on Thursday that he and Sergey V. Lavrov, the Russian foreign minister, had agreed on the resolution text, a signal that the Russians would not block it.

The resolution asks Secretary General Ban Ki-moon, in coordination with the director general at the Organization for the Prohibition of Chemical Weapons, for recommendations within 20 days on establishing a "joint investigative mechanism."

This investigative panel of experts would be authorized by the Council to "identify to the greatest extent feasible individuals, entities, groups or governments who were perpetrators, organizers, sponsors or otherwise involved in the use of chemicals as weapons."

The panel would be authorized to conduct its work for at least one year.

The resolution also requires the Syrian government and all other parties in Syria to cooperate with this panel, and it calls on other states to provide any information they may have on those responsible or involved in the "use of chemicals as weapons, including chlorine or any other toxic chemical, in the Syrian Arab Republic."

*<http://www.nytimes.com/2015/08/08/world/middleeast/un-security-council-measure-aims-to-identify-users-of-chlorine-bombs-in-syria.html?ref=topics>*

## Scientists at War: The Ethics of Cold War Weapons

Research by  
Sarah Bridger,

ISBN: 9780674736825,  
2015, Harvard

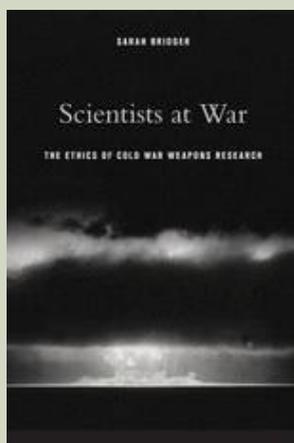
University Press

Ms. Chandreyee Chakraborty

*The author is a student of Central European University, Budapest (Department of Political Science) and an Intern at United Nations University, Bonn Germany.*

### Summary

The book discusses the role of scientists during the time of war. It provides an account of the clash of worldviews that has divided the Manhattan era scientists from the Vietnamese era scientists.



Sarah Bridger's *Scientists at War* provides a thorough look into the ethical and moral questions that shook the U.S. scientific community in the second half of the twentieth century. This book is a great combination of unknown stories and history, narrated in a synchronized manner. The book delivers an exceptional understanding of the scientist's role in the war. It also highlights the contribution of the scientists and their dilemma in the era of Vietnam and Starwars. Bridger's characters emerge as real actors facing complex problems, of morality and ethics, and this whole phenomena has been penned down in a brilliant way of storytelling. The book has a great account of the clash of worldviews that has divided the Manhattan era scientists from the Vietnamese era scientists.

Bridger has shown how different categories of scientist received different fates after the two project went live. Scientists such as Edward Teller and George Kistiakowsky saw their careers get a high leap after World War II, and they played important roles directing weapons laboratories and advising presidents. In contrast, the scientists of the Vietnam-era, such as Agent Orange and Matthew Meselson, had tough time and were marked by doubt, disillusionment, suppressed desire to speak out.

Bridger chose her words carefully so that the events of Vietnam War should not be seen as a start of ethical implications in war era for the first time. Such a view would be a very simplistic conclusion. There were examples where scientists voted for international control of atomic energy, as well as for arms-control agreements with the Soviet Union long before the Vietnam War, she writes. Even, Einstein, J. Robert Oppenheimer, and many others openly

expressed their concerns on the pages of publications such as the Bulletin of the Atomic Scientists. Though they also wanted to keep the United States of America at the cutting edge of weapons technology, especially after the Soviet Union's launched Sputnik. The satellite may have begun the space age, but it also waved a bright red flag in the arms race, demonstrating that the Soviet Union was ahead of the United States on ballistic missiles, an important delivery system for bombs.

Bridger has not tried to show this book as a protest against the deadly weapon, she has carefully bypassed this opinion and has left the issues open for discussion. She has argued that the scientists supported the Strategic defense initiative, so that the war could be kept at bay. Bridger has given numerous examples how the morality issue had slowly become one of the major part of world politics. Numerous examples are given of how, renowned scientists had advocated for disarmament, and acted as responsible citizens of the world.

The author adopts a narrative technique, where the characters speak for themselves. This makes the book more conversational and fun to read. Also there are blank spaces in the conversation which has created space for further research and integrate the scientists' thought in the larger picture of cold war era. The author has also enriched the book with lesser known facts, like that of the relationship of the scientists with Vietnam. Other facts such as how there was a difference of mentality between the new generation and old generation of scientist towards issues of ethics and morality are also discussed. Bridger did not write a conventional history of Cold War politics and ethics. The book presents a series of happenings which are fully related to one another but not as a monologue. Today the world has changed a lot, and this book hints

at the ethical dimension, which every person should follow. The world is full of disorders and the morality is the only cure of this disease.

I find this book immensely rewarding and helpful for not only the students of world history, but also for common people who are interested in war history.

# CBW Magazine

Journal on Chemical and Biological Weapons

Winter / July-December 2015



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