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The Secret Casualties of Iraq's Abandoned Chemical Weapons

By [C. J. CHIVERS](#)

A controlled detonation of recovered mustard shells near Taji, Iraq, on Aug. 17, 2008. John Paul Williams

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The soldiers at the blast crater sensed something was wrong.

It was August 2008 near Taji, Iraq. They had just exploded a stack of old Iraqi artillery shells buried beside a murky lake. The blast, part of an effort to destroy munitions that could be used in makeshift bombs, uncovered more shells.

Two technicians assigned to dispose of munitions stepped into the hole. Lake water seeped in. One of them, Specialist Andrew T. Goldman, noticed a pungent odor, something, he said, he had never smelled before.

He lifted a shell. Oily paste oozed from a crack. "That doesn't look like pond water," said his team leader, Staff Sgt. Eric J. Duling.

The specialist swabbed the shell with chemical detection paper. It turned red — indicating sulfur mustard, the chemical warfare agent designed to burn a victim's airway, skin and eyes.

All three men recall an awkward pause. Then Sergeant Duling gave an order: "Get the hell out."

Five years after President George W. Bush sent troops into Iraq, these soldiers had entered an expansive but largely secret chapter of America's long and bitter involvement in Iraq.

From 2004 to 2011, American and American-trained Iraqi troops repeatedly encountered, and on at least six occasions were wounded by, [chemical weapons](#) remaining from years earlier in Saddam Hussein's rule.

In all, American troops secretly reported finding roughly 5,000 chemical warheads, shells or aviation bombs, according to interviews with dozens of participants, Iraqi and American officials, and heavily [redacted intelligence documents](#) obtained under the Freedom of Information Act.

The United States had gone to war declaring it must destroy an active weapons of mass destruction program. Instead, American troops gradually found and ultimately suffered from the remnants of long-abandoned programs, built in close collaboration with the West.

The New York Times found 17 American service members and seven Iraqi police officers who were exposed to nerve or mustard agents after 2003. American officials said that the actual tally of exposed troops was slightly higher, but that the government's official count was classified.

Andrew T. Goldman in North Topsail Beach, N.C. In August 2008, Mr. Goldman was part of a team near Taji, Iraq, that was trying to destroy munitions that could be used in makeshift bombs. While holding a cracked shell, he noticed a strange smell. Tyler Hicks/The New York Times

The secrecy fit a pattern. Since the outset of the war, the scale of the United States' encounters with chemical weapons in Iraq was neither publicly shared nor widely circulated within the military. These encounters carry worrisome implications now that the Islamic State, a Qaeda splinter group, controls much of the territory where the weapons were found.

The American government withheld word about its discoveries even from troops it sent into harm's way and from military doctors. The government's secrecy, victims and participants said, prevented troops in some of the war's most dangerous jobs from receiving proper medical care and official recognition of their wounds.

Eric J. Duling at his home in Niceville, Fla. The cache that contaminated his explosive ordnance disposal team in 2008 was not the first discovery of chemical weapons in the war. Tyler Hicks/The New York Times

"I felt more like a guinea pig than a wounded soldier," said a former Army sergeant who suffered mustard burns in 2007 and was denied hospital treatment and medical evacuation to the United States despite requests from his commander.

Congress, too, was only partly informed, while troops and officers were instructed to be silent or give deceptive accounts of what they had found. "'Nothing of significance' is what I was ordered to say," said Jarrod Lampier, a recently retired Army major who was present for the largest chemical weapons discovery of the war: more than 2,400 nerve-agent rockets unearthed in 2006 at a former Republican Guard compound.

Jarrold L. Taylor, a former Army sergeant on hand for the destruction of mustard shells that burned two soldiers in his infantry company, joked of "wounds that never happened" from "that stuff that didn't exist." The public, he said, was misled for a decade. "I love it when I hear, 'Oh there weren't any chemical weapons in Iraq,' " he said. "There were plenty."

Chemical Weapons Found by American Forces in Iraq

Between 2004 and 2011, American forces in Iraq encountered thousands of chemical munitions. In several cases, troops were exposed to chemical agents.

Rear Adm. John Kirby, spokesman for Defense Secretary Chuck Hagel, declined to address specific incidents detailed in the Times investigation, or to discuss the medical care and denial of medals for troops who were exposed. But he said that the military's health care system and awards practices were under review, and that Mr. Hagel expected the services to address any shortcomings.

"The secretary believes all service members deserve the best medical and administrative support possible," he said. "He is, of course, concerned by any indication or allegation they have not received such support. His expectation is that leaders at all levels will strive to correct errors made, when and where they are made."

The discoveries of these chemical weapons did not support the government's invasion rationale.

After the terrorist attacks of Sept. 11, 2001, Mr. Bush insisted that Mr. Hussein was hiding an active weapons of mass destruction program, in defiance of international will and at the world's risk. United Nations inspectors said they could not find evidence for these claims.

Then, during the long occupation, American troops began encountering old chemical munitions in hidden caches and roadside bombs. Typically 155-millimeter artillery shells or 122-millimeter rockets, they were remnants of an arms program Iraq had rushed into production in the 1980s during the Iran-Iraq war.

All had been manufactured before 1991, participants said. Filthy, rusty or corroded, a large fraction of them could not be readily identified as chemical weapons at all. Some were empty, though many of them still contained potent mustard agent or residual sarin. Most could not have been used as designed, and when they ruptured dispersed the chemical agents over a limited area, according to those who collected the majority of them.

In case after case, participants said, analysis of these warheads and shells reaffirmed intelligence failures. First, the American government did not find what it had been looking for at the war's outset, then it failed to prepare its troops and medical corps for the aged weapons it did find.

As Iraq has been shaken anew by violence, and past security gains have collapsed amid Sunni-Shiite bloodletting and the rise of the Islamic State, this long-hidden chronicle illuminates the persistent risks of the country's abandoned chemical weapons.

Many chemical weapons incidents clustered around the ruins of the [Muthanna State Establishment](#), the center of Iraqi chemical agent production in the 1980s.

Since June, the compound has been held by the Islamic State, the world's most radical and violent jihadist group. In a letter sent to the United Nations this summer, the Iraqi government

said that about 2,500 corroded chemical rockets remained on the grounds, and that Iraqi officials had witnessed intruders looting equipment before militants shut down the surveillance cameras.

Soldiers in chemical protection gear, including Sgt. Eric J. Duling and Specialist Andrew T. Goldman, examining suspected chemical munitions at a site near Camp Taji, Iraq, on Aug. 16, 2008. The New York Times

The United States government says the abandoned weapons no longer pose a threat. But nearly a decade of wartime experience showed that old Iraqi chemical munitions often remained dangerous when repurposed for local attacks in makeshift bombs, as insurgents did starting by 2004.

Participants in the chemical weapons discoveries said the United States suppressed knowledge of finds for multiple reasons, including that the government bristled at further acknowledgment it had been wrong. “They needed something to say that after Sept. 11 Saddam used chemical rounds,” Mr. Lampier said. “And all of this was from the pre-1991 era.”

Others pointed to another embarrassment. In five of six incidents in which troops were wounded by chemical agents, the munitions appeared to have been designed in the United States, manufactured in Europe and filled in chemical agent production lines built in Iraq by Western companies.

Staff Sgt. Eric J. Duling, left, Specialist Andrew T. Goldman, far right, and another member of an ordnance disposal team being treated for exposure to a chemical agent in August 2008. via Andrew T. Goldman

Nonproliferation officials said the Pentagon’s handling of many of the recovered warheads and shells appeared to violate the Convention on Chemical Weapons. According to this convention, chemical weapons must be secured, reported and destroyed in an exacting and time-consuming fashion.

The Pentagon did not follow the steps, but says that it adhered to the convention’s spirit. “These suspect weapons were recovered under circumstances in which prompt destruction was dictated by the need to ensure that the chemical weapons could not threaten the Iraqi people, neighboring states, coalition forces, or the environment,” said Jennifer Elzea, a Pentagon spokeswoman.

The convention, she added, “did not envisage the conditions found in Iraq.”

Nonetheless, several participants said the United States lost track of chemical weapons that its troops found, left large caches unsecured, and did not warn people — Iraqis and foreign troops alike — as it hastily exploded chemical ordnance in the open air.

This was the secret world Sergeant Duling and his soldiers entered in August 2008 as they stood above the leaking chemical shell. The sergeant spoke into a radio, warning everyone back.

“This is mustard agent,” he said, announcing the beginning of a journey of inadequate medical care and honors denied. “We’ve all been exposed.”

Part 2

Expecting Explosives, Finding Chemical Arms

The cache that contaminated Sergeant Duling’s team was not the first discovery of chemical weapons in the war. American troops had already found thousands of similar warheads and shells.

These repeated encounters sprang from a basic feature of the occupation: After the invasion, Iraq became a battlefield laced with hidden, lethal traps — most tied to the country’s protracted history in the global arms trade.

Iraq had attacked Iran in late 1980, expecting quick victory against a military sapped of officers by Iran’s revolutionary purges. Mr. Hussein also thought Iranians might rise against their new religious leaders.

He miscalculated. By June 1981, as Iran blunted Iraq’s incursions and unleashed its air force against Iraqi cities, Mr. Hussein was seeking new weapons. He created a secret program — known as Project 922 — that produced blister and nerve agents by the hundreds of tons, according to [Iraq’s confidential declarations](#) in the 1990s to the United Nations.

Iranian soldiers wearing gas masks southeast of Basra, Iraq, in 1987, during the Iran-Iraq war. In the 1980s, while at war with Iran, Saddam Hussein created a secret program that produced blister and nerve agents by the hundreds of tons. Associated Press

War provided urgency; Mr. Hussein added the cash. Western nations, some eager to contain Iran’s Islamic revolutionary state after the American hostage crisis from 1979 to 1981, lent Iraq support.

With remarkable speed, Iraq built a program with equipment and precursor purchases from companies in an extraordinary array of countries, eventually including the United States, according to its [confidential declarations](#).

German construction firms helped create a sprawling manufacturing complex in the desert south of Samarra and three plants in Falluja that made precursor ingredients for chemical weapons. The complex near Samarra, later renamed [Al Muthanna State Establishment](#), included research labs, production lines, testing areas and storage bunkers.

Iraq produced 10 metric tons of mustard blister agent in 1981; by 1987 its production had grown 90-fold, with late-war output aided by [two American companies](#) that provided hundreds of tons of thiodiglycol, a mustard agent precursor. Production of nerve agents also took off.

Rising production created another need. Mr. Hussein's military did not possess the munitions for dispersing chemical agents. So it embarked on another buying spree, purchasing empty ordnance — aviation bombs from a Spanish manufacturer, American-designed artillery shells from European companies, and Egyptian and Italian ground-to-ground rockets — to be filled in Iraq.

As these strands of a chemical weapons program came together, Iraq simultaneously accumulated enormous stores of conventional munitions.

Much of the chemical stockpile was expended in the Iran-Iraq war or destroyed when the weapons programs were dismantled after the Persian Gulf war of 1991. But thousands of chemical shells and warheads remained, spicing the stockpile of conventional ordnance left unsecured in 2003 after Iraq's military collapsed as the United States invaded.

Chemical munitions can resemble conventional munitions — a problem compounded by Iraq's practice of mislabeling ordnance to confuse foreign inspectors and, with time, by rust, pitting and dirt.

These were the circumstances that combined against ordnance disposal teams as they pursued their primary duty in the war: defeating makeshift bombs.

Almost all of the bombs were made with conventional ordnance or homemade explosives. Here and there, among the others, were bombs made from chemical arms.

Part 3

On a Routine Mission, 'Bit' by Sarin

Staff Sgt. James F. Burns, a team leader in the 752nd Explosive Ordnance Disposal Company, peered into a video screen at a bomb's cracked remains.

It was an unusual device. A short while before, it had been detonated beside an American patrol in southwest Baghdad. The blast had been small. No one had been wounded.

Two ordnance disposal techs, Sergeant Burns (since promoted to first lieutenant) and Pfc. Michael S. Yandell, manipulated a robot toward the device to examine it via video feed. They expected to find a high-explosive shell.

The video showed a damaged shell rigged to a telephone cable. It was May 15, 2004. Weeks before, Sergeant Burns had found a similar bomb made with an illumination shell — a pyrotechnic round that lacked explosive power. It, too, had been rigged with an identical telephone cable.

Staff Sgt. James F. Burns in Baghdad in 2004. A week after this image was taken, he and another technician put what they thought were the remains of a familiar makeshift bomb into their truck. Soon the symptoms began: headache, nausea, disorientation and pinpointed pupils. Mohammed Uraibi/Associated Press

This shell, the sergeant thought, was a duplicate. The bomb maker had goofed again.

To prevent militants from reusing materials, disposal teams often destroyed any warheads and shells they found on the spot. But snipers stalked this neighborhood. Sergeant Burns understood that risks grew the longer the soldiers remained. He decided he would destroy the shell near their base.

Private Yandell carried the shell to their truck bed.

The drive back passed through a bazaar. Sergeant Burns noticed a bitter smell and thought, he said later, that “it was rotten vegetables.”

Then he felt the [onset of a headache](#). He told Private Yandell, who was driving, that he did not feel right.

Nauseated and disoriented, Private Yandell had quietly been struggling to drive. His vision was blurring. His head pounded. “I feel like crap, too,” he replied.

Dread passed over Sergeant Burns. Maybe, he wondered aloud, they had picked up a nerve agent shell.

The chemical shell Sergeant Burns and Pfc. Michael S. Yandell found that day was on the highway to Baghdad’s international airport, called “Death Street” at the time because of frequent insurgent attacks.

Neither man remembers the drive’s last minutes. At the base entrance, they did not clear the ammunition from their rifles and pistols — forgetting habits and rules.

As they arrived at their building, Sergeant Burns was sure. In the back of the truck, the shell had leaked liquid. Illumination rounds, he knew, do not do that.

“I thought: ‘I’ve gotten Mike killed, and maybe everyone else around here, driving a chem round onto the FOB,’” he said, using the acronym for forward operating base.

Disposal teams kept bleach for decontamination. Sergeant Burns found a jug and poured it onto the shell before stumbling to the showers, where he found Private Yandell at a mirror, transfixed by his own image.

“It was just pinpointed pupils,” Mr. Yandell later recalled. “And that is like the classic sign of sarin exposure.”

He faced the sergeant. “I don’t want to freak you out,” he said. “But look.”

Private Yandell’s irises were so constricted they seemed solid. “I didn’t see pinpointed pupils,” Lieutenant Burns said recently. “I didn’t see his pupils at all.”

James F. Burns with his dog Koda, at his home in Yakima, Wash. After his team found the chemical shell in 2004, “They put a gag order on all of us – the security detail, us, the clinic, everyone,” he said of higher-ups. “We were briefed to tell family members that we were exposed to ‘industrial chemicals,’ because our case was classified Top Secret.” Tyler Hicks/The New York Times

The soldiers lived with three sailors, who told them to rush to the clinic.

The soldiers staggered in claiming exposure to a nerve agent. The staff, Mr. Yandell said, acted as if he and Sergeant Burns were lying. “They suspected we were doing drugs or something,” he recalled.

A medic who had been with them vouched that they had just handled an artillery shell. The staff changed its stance. “They stripped us down and helped us shower,” Mr. Yandell said.

“Pt being admitted for possible chemical contamination,” his [record reads](#), noting the pinpointed pupils, headache and dizziness. “Wheezing audible.”

The two techs were given oxygen, then Tylenol. At 3:20 p.m., medics irrigated their eyes with atropine gel.

By then the Navy techs had examined the shell. Word was circulating. Sergeant Burns’s team had picked up an exceedingly rare weapon: a 152-millimeter binary sarin shell.

152mm Binary Sarin Round

The chemical precursors are kept in two separate canisters, which break after launch. The precursors then mix together, forming liquid sarin.

In 1988, late in the war against Iran, Iraq had tested a batch of prototype 152-millimeter shells containing segregated containers for sarin precursors, according to its [confidential declarations](#).

Very few were thought to have been assembled, fewer still to have survived. But this one found its way into a makeshift bomb. Sergeant Burns and Private Yandell mistook it for an illumination round in part, several techs said, because it was so rare it was not in the military’s standard ordnance recognition guides.

Its canisters had ruptured during the roadside bomb’s detonation, mixing precursors to create sarin with a purity of 43 percent — more than enough to be lethal.

Private Yandell had handled the shell without gloves. Both men inhaled sarin vapors. Their cases, said Col. Jonathan Newmark, a retired Army neurologist, became “the only documented battlefield exposure to nerve agent in the history of the United States.”

As the two soldiers were afflicted by symptoms of this unlucky distinction, their supervisors initially pressed for a cover-up.

“They put a gag order on all of us — the security detail, us, the clinic, everyone,” Lieutenant Burns said. “We were briefed to tell family members that we were exposed to ‘industrial chemicals,’ because our case was classified top secret.”

Two days later, the military released an account of their sarin exposure, without revealing names or units involved. Brig. Gen. Mark Kimmitt, a spokesman, offered a prescient warning: “There may be more out there.”

A Navy explosive ordnance disposal team in 2004, sealing the sarin shell that had wounded Sergeant Burns and Private Yandell. Christopher Jewett/United States Navy

For nearly a decade this would be the only time the military released details of a chemical incident in Iraq in which troops were exposed.

Ten days after the incident, both soldiers were awarded Purple Hearts. Both men said their company commander urged them to rest.

Explosive ordnance disposal technicians are part of a small field with a code that encourages selflessness: Any call one team does not take, another team must.

In June the two soldiers, still suffering symptoms, including intense headaches and difficulties with balance, asked to return to duty. Soon they were ordered to a site hit by 60-millimeter mortar fire.

Two shells had been duds. They were stuck, fins up, in the sand. Sergeant Burns freed them with rope and then set off carrying them to a disposal pit.

“I was walking with one in each hand, and I just fell,” he said. “I remember falling and trying to keep the fuzes from hitting the ground.”

He wondered why the Army had not sent the two of them home. “We really should not have been operating out there,” he said.

Part 4

Playing Down Dangers, Withholding Evidence

In September 2004, months after Sergeant Burns and Private Yandell picked up the leaking sarin shell, the [American government issued a detailed analysis of Iraq’s weapons programs](#). The widely heralded report, by the multinational Iraq Survey Group, concluded that Iraq had not had an active chemical warfare program for more than a decade.

The group, led by Charles A. Duelfer, a former United Nations official working for the Central Intelligence Agency, acknowledged that the American military had found old chemical ordnance: 12 artillery shells and 41 rocket warheads. It predicted that [troops would find more](#).

The report also played down the dangers of the lingering weapons, stating that because their contents would have deteriorated, “any remaining chemical munitions in Iraq do not pose a militarily significant threat.”

Army and Navy technicians prepare unexploded ordnance for demolition in 2003 near Baghdad. American troops destroyed thousands of arms caches in Iraq, some of which contained chemical weapons, including chemical weapons the troops did not report. Erica Gardner/United States Navy, via Getty Images

By then the Pentagon had test results showing that the sarin shell could have been deadly. American chemical warfare specialists also knew, disposal technicians and analysts said, that in the 1980s Iraq had mastered mustard agent production in its Western-built plant. Its output had been as pure as 95 percent and stable, meaning that the remaining stock was dangerous.

Reached recently, Mr. Duelfer agreed that the weapons were still a menace, but said the report strove to make it clear that they were not “a secret cache of weapons of mass destruction.”

“What I was trying to convey is that these were not militarily significant because they not used as W.M.D.,” he said. “It wasn’t that they weren’t dangerous.”

The Duelfer report also claimed that the United States had cleared more than 10,000 arms caches but found no other chemical ordnance. Several disposal technicians said this claim was false, though the report’s authors did not know it.

One reason that government tallies were low, and that Mr. Duelfer’s team was not aware of all the chemical weapons recoveries, the techs said, was that by 2004 the military’s procedures for handling Iraq’s chemical weapons had created disincentives for troops to report what they found.

During 2003 and 2004, the United States hunted for unconventional weapons and evidence that might support the rationale for the invasion. But as the insurgency grew and makeshift bombs became the prevailing cause of troops’ wounds, the search became a lower priority for the rank-and-file. Some saw it as a distraction.

One tech who served three tours in Iraq said his team twice encountered chemical weapons, but did not report one of them.

That was in 2004, he said, when his team found a mustard shell in a conventional ordnance cache. Reporting it, he said, would have required summoning chemical warfare specialists, known as a technical escort unit, and adding 12 to 24 hours to the job. The team decided to put the mustard shell with the high-explosive shells and, he said, “get rid of it.”

In the difficult calculus of war, competing missions had created tensions. If documenting chemical weapons delayed the destruction of explosive weapons that were killing people each week, or left troops vulnerable while waiting for chemical warfare specialists to arrive, then reporting chemical weapons endangered lives.

Many techs said the teams chose common sense. “I could wait all day for tech escort to show up and make a chem round disappear, or I could just make it disappear myself,” another tech said.

The tech who exploded a mustard shell in 2004 said the disposal teams had little time to register and report each item they found in Iraq’s stockpiles. Everything, he said, went into demolition piles.

“You set up these huge shots day after day and you don’t research every single round because you would just use up all of your time doing research,” he said. “There were more chem rounds that were discovered and just blown in place.”

Late in 2004, roughly simultaneous to the release of the Duelfer report, the Army signaled internally that it was concerned about the risks of chemical weapons by distributing detailed [new instructions for treating troops exposed to warfare agents](#).

One of the memorandums, by the Medical Command, stated that “exposure to chemical weapons is a continuing and significant risk to our deployed forces.” The instructions required blood and urine tests for patients and follow-up tracking of the exposed — for life.

In the years ahead, these steps would often not be followed.

By then the soldiers wounded by sarin had returned home. They still suffered symptoms. Private Yandell complained of severe headaches. Sergeant Burns, in a note for his [medical record](#) in late 2004, described memory lapses, reading difficulties, problems with balance and tingling in his legs.

“I have been dropping items such as tools, soda cans, cups of water, pens and pencils,” he wrote. “I will stumble or nearly fall while standing up from a chair. While speaking, I will stutter or stammer and lose my thought.”

Michael Yandell at Fort Worth Botanic Garden in Texas. After he and another soldier staggered into a clinic claiming exposure to a nerve agent in Iraq in 2004, the staff, he said, acted as if they were lying. “They suspected we were doing drugs or something,” he recalled. Tyler Hicks/The New York Times

Nonetheless, the Pentagon continued to withhold data, leaving the public misinformed as discoveries of chemical weapons accelerated sharply.

In late 2005 and early 2006, soldiers collected more than 440 Borak 122-millimeter chemical rockets near Amara, in southeastern Iraq. And in the first nine months of 2006, the American military recovered roughly 700 chemical warheads and shells, according to [data obtained under the Freedom of Information Act](#).

British forces also destroyed 21 Borak rockets in early 2006, including some that contained nerve agent, according to a public statement to the Organization for the Prohibition of Chemical Weapons in 2010.

The Pentagon did not provide this information to the [Senate Select Committee on Intelligence](#) as it worked in the summer of 2006 examining intelligence claims about Iraq's weapons programs.

Even as the Senate committee worked, the American Army made its largest chemical weapons find of the war: more than 2,400 Borak rockets.

The rockets were discovered at Camp Taji, a former Republican Guard compound, when Americans "running a refueling point for helicopters saw some shady activity on the other side of a fence," said Mr. Lampier, who lived at the camp at the time.

An Iraqi digging with a front-end loader ran away when an American patrol approached, leaving behind partly unearthed rockets.

Mr. Lampier, then a captain commanding the 756th Explosive Ordnance Disposal Company, was with the first to arrive. "At first we saw three," he said. "Then it wasn't three. It was 30. Then it wasn't 30. It was 300. It went up from there."

The rockets appeared to have been buried before American airstrikes in 1991, he said. Many were empty. Others still contained sarin. "Full-up slosers," he said.

At least 38 techs worked for weeks, excavating rockets, crushing many of them and then reburying them and covering them with concrete. Mr. Lampier said he was told to describe the work in blandly bureaucratic terms: "Nothing of significance."

With this discovery, the American military had found more than 3,000 pieces of chemical ordnance and knew that many were still dangerous. The military did not disclose this as the Senate worked; instead, it stood by data from the Army's National Ground Intelligence Center that it had declassified in late June, leading the Senate to publish an inaccurate report.

The [report](#), released in September 2006, claimed "another 500 filled and unfilled degraded pre-1991 chemical munitions" had been found — about one-sixth of the Pentagon's internal tallies.

This tally, obsolete as it was published, was not updated in the ensuing years, as more chemical weapons were found and as more troops were exposed.

The publicly released information also skirted the fact that most of the chemical artillery shells were traceable to the West, some tied to the United States.

These shells, which the American military calls M110s, had been developed decades ago in the United States. Roughly two feet long and weighing more than 90 pounds, each is an aerodynamic steel vessel with a burster tube in its center.

The United States has long manufactured M110s, filling them with smoke compounds, white phosphorus or, in earlier years, mustard agent. [American ordnance documents](#) explicitly describe the purpose of an M110 filled with blister agent: "to produce a toxic effect on personnel and to contaminate habitable areas."

The United States also exported the shells and the technology behind them. When Iraq went arms shopping in the 1980s, it found manufacturers in Italy and Spain willing to deal their copies. By 1988, these two countries alone had sold Iraq [85,000 empty M110-type shells](#), according to confidential United Nations documents. Iraq also obtained shells from Belgium.

By 2006, the American military had found dozens of these blister-agent shells in Iraq, and had reports of others circulating on black markets, several techs said. Tests determined that many still contained mustard agent, some at a purity level of 84 percent, officials said.

Had these results been publicly disclosed, they would have shown that American assertions about Iraq's chemical weapons posing no militarily significant threat could be misread, and that these dangerous chemical weapons had Western roots.

Public disclosure might also have helped spur the military's medical system to convert its memorandums into action, and to ready itself for wounds its troops were bound to suffer.

Part 5

'Bit' by Blister Agent in Roadside Bombs

Once American forces began finding large numbers of M110 shells, it was all but inevitable that disposal teams would be exposed to blister agent.

This happened for the first time, several techs said, on Sept. 25, 2006, after militants detonated two roadside bombs near an American patrol in southern Baghdad.

Two Navy techs — Chief Petty Officer Ted Pickett and Petty Officer Third Class Jeremiah M. Foxwell — arrived at the blast site.

They found three damaged shells, decided against destroying them in a populated area, and drove them to a demolition range beside their base, according to Mr. Foxwell, who left the Navy in 2008.

There they discovered that one 155-millimeter shell had leaked a noxious liquid. As he inhaled its vapors, Petty Officer Foxwell was instantly alarmed. "It smelled overbearingly like extreme toxicity," he said recently. "The hair stood up on the back of my neck."

The shell contained a brown crystalline substance they had thought was a homemade explosive. A swab with detection paper tested positive for sulfur mustard.

The sailors radioed for a technical escort unit, then put on gloves and gas masks and wrapped the shell in plastic and duct tape. They waited. Hours passed. No chemical specialists arrived.

Mustard agent acts slowly on victims. Symptoms of exposure often do not appear for hours, and intensify for days.

Late that afternoon, with the sailors worried about the effects of mustard inhalation, they destroyed the shell with an explosive charge and entered the Army clinic on their base.

Jeremiah M. Foxwell at his home in Washington. In 2006 while a Navy petty officer, he and another technician handled a leaking sulfur-mustard shell. “It smelled overbearingly like extreme toxicity,” Mr. Foxwell said. “The hair stood up on the back of my neck.” Tyler Hicks/The New York Times

Within two days lesions formed in Petty Officer Foxwell’s nasal passages and upper airway, according to his medical records, which noted exposure to “chemical vapors — mustard gas” from a “terrorist chemical weapon.”

But the care he would receive proved to be much less than that mandated under the Army’s treatment order.

The clinic did not perform the required blood and urine tests on Petty Officer Foxwell, according to his medical records. (His former team chief did not reply to written questions.)

Both men were returned to duty within days, though Mr. Foxwell said his breathing remained labored and his chest hurt.

Dr. Dave Edmond Lounsbury, a former Army colonel who helped prepare for the chemical warfare victims expected at the war’s start in 2003, said in an interview that Petty Officer Foxwell’s care was inadequate.

“When you first meet the patient it is impossible to tell how he is going to do,” he said. “You have to get the blood work, monitor him and follow him over time.”

“To return them soon to duty?” he said. “I would be uncomfortable with that.”

Dr. Dave Edmond Lounsbury, a former Army colonel who helped prepare for the chemical-warfare victims expected at the war’s start in 2003, says that secrecy about troops later wounded by chemical weapons was extensive. Mac William Bishop/The New York Times

The Army opened an investigation into why the chemical specialists were delayed in arriving. An officer taking statements from participants forbade Petty Officer Foxwell from discussing the incident with his peers, restricting him from issuing a warning.

“I couldn’t walk outside and tell the next route-clearance team that this was out there,” he said. “It was just not natural, the idea of not sharing. If you experience a new battlefield weapon, it is your responsibility to share that actionable information with other teams.”

Mr. Foxwell said his Navy officer-in-charge did not visit them in the clinic or submit them for Purple Hearts. The insurgents’ use of a mustard shell faded from view. “No one in my chain of command, outside of Ted, discussed the incident with me again,” he said.

After Mr. Foxwell was honorably discharged, the Veterans Administration awarded him a partial medical disability in 2008, noting chronic respiratory infections and the development of asthma.

The incident was a foreboding sign. Several months later, on March 11, 2007, two Army techs were burned.

This second exposure occurred when a team from the 756th Explosive Ordnance Disposal Company was summoned to a roadside bomb made with a rusty artillery shell.

The team remotely detonated the shell and continued to the usual steps: checking to ensure the bomb was rendered harmless, and collecting evidence.

Specialist Richard T. Beasley, one of the techs, picked up the broken shell, not knowing it contained mustard agent, and stowed it in a bin on their truck beside a fresh-air intake.

Challenges Identifying Chemical Weapons in Makeshift Bombs

Improvised bombs were often built from Iraq's stockpile of old artillery rounds. Dirty and corroded exteriors made it difficult to tell whether shells were chemical or conventional.

An X-ray of internal features was sometimes the only way to tell chemical from conventional shells. But X-rays are often impractical in a war zone.

A foul smell filled the truck and irritated the soldiers' eyes. Suspecting the shell was the odor's source, they stopped and heaved it into a deep canal.

The next day Specialist Beasley noticed his pant leg was wet. Mustard exposure symptoms had set in. "I undid my pants," he said, "and felt the bubble."

His fingers were tracing a [seeping blister nearly the size of his hand](#).

His team leader, a former sergeant who asked that his name be withheld to protect his medical privacy, discovered a similar blister on his own left leg.

At first the soldiers were confused. Then, remembering the odorous shell, the sergeant felt a rising fear. If that was mustard, he thought, and was burning their skin, what might be happening in their lungs?

The patrol sped to an Army clinic at Camp Taji.

Had the techs been burned a few years earlier, the military medical system, which had prepared before the invasion for chemical warfare casualties, might have recognized their wounds. But in 2007, with blast and gunshot wounds the predominant causes of casualties, the doctors were not ready.

The Army's medical orders were not followed. The staff rinsed the soldiers' eyes, put cream on Specialist Beasley's blister, and turned them away.

"I don't know how to describe it, except to say: confusion," the former sergeant said. "They really didn't know what to do. The general feel was a whole lot of people shrugging their shoulders nonstop."

The soldiers returned to Balad Air Base, where they were stationed, and visited another clinic.

A doctor [ordered treatment](#) with painkillers, antibiotics, burn cream and cleaning of the blisters — a sensation, the former sergeant said, "like a having a wire dog brush being rubbed across your leg."

Specialist Beasley's [medical record](#) shows that blood and urine specimens confirmed the mustard agent exposure. But the patients were not admitted to a hospital.

Mr. Lampier, then the soldiers' commander, said he argued that they should be evacuated to the United States. "They were raw meat trying to heal in the worst environment imaginable," he said. "There was dust and ash and smoke from the burn pits, and they had these wounds that shouldn't have been exposed to that."

The soldiers remained outpatients at a clinic.

All the while secrecy prevailed. The military determined the soldiers had been burned by an M110 shell. Both victims said word of their exposure was purposefully squelched.

"We were absolutely told not to talk about it" by a colonel, the former sergeant said. The order, he added, included prohibitions against mentioning mustard agent when writing home.

The secrecy was so extensive that Dr. Lounsbury said he suspected officials hid the cases even from him and two other Army doctors assigned to prepare an official textbook on treating battlefield wounds.

Their book, "War Surgery in Afghanistan and Iraq: A Series of Cases, 2003-2007," published in 2008, provided an inventory of traumas and treatments.

"We would have certainly included this case if we had known about it," he said, "and not just for obvious medical reasons but because here was exactly the kind of wounds at the very heart of the reason the government sent our nation to war."

The exposed soldiers' objections to how their cases were handled grew after their commander submitted them for Purple Hearts.

The medals were disapproved by the headquarters of the American-led coalition "because the incident was deemed to have occurred after the I.E.D. was destroyed, and therefore was no

longer considered to have been in contact with the enemy,” Tatjana Christian, an Army spokeswoman, said, using the abbreviation for an improvised explosive device.

In March 2007, Specialist Richard T. Beasley picked up a broken shell, not knowing it contained mustard agent. The next day, while on another call, he noticed his pant leg was wet. Chemical blisters erupted on his leg. Via Richard T. Beasley

Purple Hearts, awarded for “wounds received in action,” according to their certificates, are a respected martial decoration. They are also contentious, given the subjectivity in defining “action.”

This is particularly true in the ordnance disposal field, because improvised bombs are dangerous before and after a foe sets them out. Bombs made with chemical ordnance pose more questions, because unlike explosives, chemical agents do not pass from dangerous to harmless in a flash.

Several techs pointed out that chemical munitions found in explosive devices were a result of conscious enemy action. But troops wounded by chemical devices were treated inconsistently: Some received the medal, others did not.

Under presidential order, Purple Hearts are awarded by each military service, which follow separate rules.

The Army regulation, another spokesman said, excludes soldiers wounded by chemical agents not released by an enemy. And because this exposure was caused when the soldiers destroyed the chemical device, he said, it did not qualify for Purple Hearts.

Mr. Beasley, who was honorably discharged in 2008, said the Army’s position was dismissive. “I remember it being, basically, that we wounded ourselves,” he said, which he called “baloney.”

“I didn’t put that shell in that hole,” he said. “And I did exactly what we were supposed to do when we dealt with an I.E.D.”

In the years since he returned to the United States and left the Army, he said, the Army has never contacted him again. His follow-up care amounted to one unsatisfying visit to a doctor near his last base.

“I went to a civilian doctor who didn’t actually believe I had been exposed to mustard agent,” he said. “That was the extent of my follow up.”

Part 6

On the Old Chemical Warfare Complex, Marines Find Mustard

By mid-2008, as incidents with mustard shells accumulated, ordnance disposal techs suspected one area had become a principal source of the weapons: Al Muthanna State Establishment, the former nexus of Iraq's chemical warfare program.

Although incidents with chemical arms were scattered across Iraq, many were clustered near the ruined complex, which this June was overrun by the Islamic State.

United Nations disarmament inspectors at the Muthanna State Establishment, the former nexus of Iraq's chemical-warfare program, in 2002. After the American-led invasion of 2003, many incidents with chemical arms were clustered near the ruined complex. Karim Sahib/Agence France-Presse-Getty Images

During the occupation, little remained of Al Muthanna. The United States had destroyed much of it from the air in the 1991 gulf war. United Nations demilitarization in the 1990s had made the grounds a boneyard.

But one bunker, a massive, cruciform structure, still contained a menacing dud — a 2,000-pound airdropped bomb among a stockpile of sarin-filled rockets, according to people familiar with the complex.

On July 11, 2008, a platoon of Marines unwittingly discovered that another bunker still held mustard shells, too.

The shells were found after about 15 Marines from the Second Tank Battalion's scout platoon noticed a freshly cut hole in a small bunker, according to three Marines who participated.

A peek inside, said one of them, Jace M. Klibenski, then a corporal, showed "there were just rounds everywhere."

As the Marines were carrying the shells out, another corporal swore. Mustard agent had spilled on his upper body. Corporal Klibenski helped him pull off his fire-retardant shirt.

"We climbed out," he said, "and high-tailed it" to their base, Combat Outpost Hawas, from which they were moved by helicopter to Balad Air Base.

Six Marines had been exposed: five lightly, and the corporal who had lifted the leaking shell, the participants said. Doctors sedated him ahead of the expected symptoms.

"He was pretty much just laying flat as the blisters started popping up," said another participant, Jonathan Martin, then a private first class.

The exposed corporal's skin erupted on his right arm, left hand, right side and feet, according to the victim, who asked for anonymity to protect his medical privacy.

The military evacuated the corporal to the United States. Five days after being burned, he was awarded a Purple Heart. He later returned to duty.

Mr. Klibenski said an officer visited the other five exposed Marines at Balad and urged them not to talk about what had happened. “They told us that this was something that was going to be kept confidential for a long time,” he said.

The incident remained out of public view, and with it knowledge that mustard shells remained on Al Muthanna — long after two wars and an international demilitarization effort to remove them.

Part 7

The Shells Beside the Lake

The military’s handling of mustard exposure cases — combining reflexive secrecy, substandard medical care and an inconsistent awards system — reached a low point after Sergeant Duling’s team was exposed on Aug. 16, 2008.

The exposures followed the discovery of a seemingly small batch of artillery shells by Bushmaster Company, First Battalion, 14th Regiment, a mechanized Army infantry unit searching an area from which American forces had taken fire.

Specialist Andrew T. Goldman examining leaking chemical rounds at a site near Camp Taji, Iraq, on Aug. 16, 2008. The New York Times

Sergeant Duling, of the 710th E.O.D. Company, arrived and relieved another disposal team. The first team leader was in a chemical protection suit.

“He was shot,” Sergeant Duling recalled. “It was like 115 degrees. He was throwing up in his mask.”

“I said, ‘Roy, we can take it from here.’ ”

Sergeant Duling and his team put on protective suits, approached the crater from upwind and found a pile of rusty 155-millimeter shells. They tested negative for chemical agents.

Relieved, the techs removed their chemical suits and detonated the pile from afar. The blast unearthed still more munitions.

Soldiers from Bushmaster Company formed a human chain to stack shells for another blast, said one participant, Philip Dukett, a former sergeant. “I would pick one up,” he said, “put it on my thigh, and pass it on.”

In the blast crater, Specialist Goldman noticed one of the shells was leaking; soon it tested positive for sulfur mustard. He swore.

Sergeant Duling ordered everyone to decontaminate with bleach, but the team was not fully prepared. “Then I was out of bleach, so I just used baby wipes and hand sanitizer and whatever else I could find to clean myself up,” he said.

Mr. Goldman says he still suffers headaches, fatigue and shortness of breath from his exposure.
Mac William Bishop/The New York Times

The chemical specialists did not arrive until after midnight.

Shortly after dawn on Aug. 17 the disposal techs and the chemical specialists detonated the pile, including many M110 mustard shells. An orange blast shook the desert.

Weary soldiers laughed as the breeze caught the blast's gray-brown plume. They had been told the explosion's heat would destroy the agent. "Ahhh!" one shouted, mockingly. "It's mustard gas!"

When the cloud reached them, they coughed. "Everything smelled really funky," Mr. Taylor said recently. "The smoke really irritated our eyes and kind of burned more than smoke from a usual controlled det."

The blast had uncovered still more shells.

Sergeant Duling and his soldiers were spent, and had a more pressing priority — finding medical care.

They undressed, set their contaminated clothes afire with a thermite grenade, and left, leaving the shells unsecured. The Army did not return for two months, when it destroyed more than 20 remaining mustard shells, a participant said.

The team entered a clinic at Camp Taji. The staff, all three victims said, was unhelpful. "They said, 'Well, you're not showing any signs or symptoms, so you weren't exposed,' " said Mr. Goldman, who was honorably discharged in 2012.

In the shower a short while later, he felt a blister on his buttock. Sergeant Duling struggled to breathe.

The soldiers slept a few hours, woke feeling worse, and returned. By then, Mr. Goldman said, he too was short of breath. Blisters were forming around his eyelids.

The medical staff remained unmoved. On Aug. 18, two days after the exposure, an optometrist prescribed drops for Specialist Goldman's eyes.

Their company commander, Capt. Patrick Chavez, who retired as a major in 2013, said that rather than help the patients, the clinic seemed intent on proving them wrong. "They were trying to come up with other causes for the symptoms — heat exhaustion, things like that," he said.

He gave the team a week off.

As the techs went untreated, burns and blisters broke out on two soldiers from Bushmaster Company, who lived at another outpost.

One, Staff Sgt. Adam Hulett, noticed a large blister on his left foot, which turned bright yellow. Medics told him to put cream on it, he said.

“I went to the Internet feeling something was not right with their assessment and did a search on ‘mustard gas exposure,’ ” he said. The search results showed “the same symptoms I was having.”

Blisters also rose on [Sergeant Dukett’s right thigh](#), as if someone had pressed a hot iron against his skin.

Both sergeants were evacuated to Germany, while the more heavily exposed victims were still denied treatment.

On Aug. 23, the [Camp Taji clinic informed Specialist Goldman that he was fine](#). “Discontinue treatment O.K. to resume normal mission,” his records read.

The team returned to duty. The first day out, when Sergeant Duling was examining an exploded device, he quickly gasped for air.

“I literally got back to the truck and took off all the body armor, poured a bottle of water on my head and sat on the steps,” he said. “I pulled us off mission and we went back to medical.”

Still the doctors resisted. It was as if, Sergeant Duling said, the staff suspected the soldiers were malingerers. “We came in, we’re not bleeding, we’re not missing body parts,” he said. “So they were kind of like, ‘What’s your problem? ‘Are’ — you know, typical response – ‘are you trying to get out of duty?’

“It was sheer stupidity on their part.”

The clinic’s attitude changed, the techs said, only after a platoon leader broke the chain of command, sending photographs of Specialist Goldman’s blisters to a supervisor in the United States.

[Medical records](#) show the shift. On Sept. 1, a physician dropped the line that Specialist Goldman could return to duty. He reclassified the case: “poisoning by mustard gas.”

The team was flown to Germany and then to Walter Reed Army Medical Center in Washington. A colonel visited from the Aberdeen Proving Ground, an Army chemical warfare center, to discuss lab results.

“He said we would probably never see the paperwork, but our blood showed that we had all been exposed to mustard agent, and that my exposure was the highest,” Mr. Goldman said.

These lab results were not put in his medical records, Mr. Goldman said.

Why such vital information was withheld is not clear. The Army Medical Command, in a written statement, said it was unsure.

Next the Army took up the question of Purple Hearts. Captain Chavez submitted the soldiers for the medals. In late October, the hospital staff told them the secretary of the Army, Pete Geren, would present awards and they needed soldiers for the photographs.

Sergeant Duling said he was told his medal had been approved first and the others' would follow.

Mr. Geren pinned the medal on Sergeant Duling's uniform on Oct. 23, and the Army announced he had been wounded by "blister agent while conducting operations in North Taji."

The turnabout came weeks later. The team was told their Purple Hearts had been denied and that Sergeant Duling could not wear the medal — no matter the Army secretary's role in presenting it.

Tatjana Christian, an Army spokeswoman, said Purple Hearts "were denied because the mustard agent that affected them was not caused by enemy actions."

Staff Sgt. Eric J. Duling speaking at his home in Florida, on June 27, 2013. Mac William Bishop/The New York Times

Another Army spokesman, who asked that his name be withheld so he could speak candidly, said it appeared the ceremony's organizers had erroneously reissued Sergeant Duling a Purple Heart he had previously received for wounds from a bomb blast in 2006.

The rejection was a bitter turn. "They said, 'You blew a cache and got bit, but it wasn't enemy action,' " Sergeant Duling said. "I'm like, 'Wait a minute, who put them rounds there? And why were we in this country in the first place?'"

The mustard exposure left him in permanently poor respiratory health; in 2013 he had surgery to keep his airway open.

Mr. Goldman said he still suffered headaches, fatigue and shortness of breath. The Army, he said, has not tracked him to see how he has fared — part of what he described as a pattern of indifferent leadership and lackluster care, and secrecy to protect the bungling.

"Our doctors screwed up our treatment so much," he said, "they didn't want it public because it would have ruined their careers."

Prompted by the Times reporting, the Army acknowledged that it had not provided the medical care and long-term tracking required by its chemical exposure treatment guidelines. It said it would identify all troops and veterans who had been exposed and update and follow their cases.

"We're at the point of wanting to make this right," Col. Bill Rice, director of Occupational and Environmental Medicine of the Army Public Health Command said last Friday. "We can't change the past, but we can make sure they are pointed in the right direction from this point forward."

Unfinished Business: An Unspoken Legacy of Chemical Arms

At American prodding, Iraq entered the Convention on Chemical Weapons in early 2009. From that moment, its fledgling government assumed primary responsibility for securing and destroying any chemical munitions remaining from Mr. Hussein's time.

The difficulties this posed for Iraq's troops became clear in April 2010 when an Iraqi police patrol found about a dozen M110 mustard shells near the Tigris River.

One of the police officers involved, Farhan Hachel, said he and others were ordered to gather the shells and take them to Awenat, a village south of Tikrit.

Officer Hachel picked up one of the shells and carried it across his chest. He woke the next morning with "small bubbles" on his upper body, blisters, he said that "were growing really fast."

The next day, he said, "I received a phone call from my colleagues asking me if I was doing O.K., as two others were suffering the same thing."

His friends told him then that they had carried leaking chemical shells.

In all, seven Iraqi police officers were burned, Officer Hachel and officials said. The American military secretly destroyed the shells, and photographed and briefly treated the burned police officers. The care was cursory.

"They gave us some creams and sent us home," Officer Hachel said.

And still more mustard shells were found.

The last large discovery of chemical rounds widely known among ordnance techs occurred at a surprising place — a security compound known as Spider, beside a highway south of Tikrit.

During the occupation, both American and Iraqi units had worked from the compound. The presence of mustard shells there, soldiers said, appeared a result of negligence.

The discovery, described by different sources as in 2010 or early 2011, was made when an Iraqi security officer visited Contingency Operating Base Speicher, and told the ordnance disposal troops there that Iraqi troops had opened a shipping container and found it packed with chemical shells.

The report led to Operation Guardian, when an American soldier from a technical escort unit, wearing a protective suit and mask and carrying a detector, reopened the shipping container.

A detector's alarm immediately rang, warning of mustard agent, said Staff Sgt. Paul Yungandreas, one of the American techs assigned to recover the shells.

Inside were stacks of M110-style shells. "We carried out the rounds, one by one, and put them on plastic tarps," he said.

The operation's planners had expected 150 to 200 shells. The disposal technicians found nearly 400.

Many of the shells were empty. Others still contained mustard agent. Most showed signs of age and decay.

Many had been wrapped in plastic — a powerful indicator, several techs said, that they had been collected elsewhere by an American or an Iraqi unit, which then failed to secure them properly.

Like most incidents in which American troops encountered chemical weapons in Iraq, Operation Guardian was not publicly disclosed.

By then adherence to the international convention, and the security of the stock, was not much longer a Pentagon concern.

The United States had invaded Iraq to reduce the risk of the weapons of mass destruction that it presumed Mr. Hussein still possessed. And after years of encountering and handling Iraq's old chemical arms, it had retroactively informed the Organization for the Prohibition of Chemical Weapons in 2009 that it had recovered more than 4,500 chemical weapons.

But it had not shared this data publicly. And as it prepared to withdraw, old stocks set loose after the invasion were still circulating. Al Muthanna had still not been cleaned up.

Finding, safeguarding and destroying these weapons was to be the responsibility of Iraq's government.

Iraq took initial steps to fulfill its obligations. It drafted a [plan to entomb the contaminated bunkers on Al Muthanna](#), which still held remnant chemical stocks, in concrete.

When three journalists from The Times visited Al Muthanna in 2013, a knot of Iraqi police officers and soldiers guarded the entrance. Two contaminated bunkers — one containing cyanide precursors and old sarin rockets — loomed behind. The area where Marines had found mustard shells in 2008 was out of sight, shielded by scrub and shimmering heat.

The Iraqi troops who stood at that entrance are no longer there. The compound, never entombed, is now controlled by the Islamic State.

Documentary

Chemical Secrets of the Iraq War

[Participants and victims of this secret chapter of the Iraq war discuss exposure to chemical weapons.](#)

Documents

- [Medical Records of U.S. Casualties of Iraq's Chemical Weapons](#)
- [U.S. Intelligence Documents on Chemical Weapons Found in Iraq](#)
- [Iraq's Disclosure of Chemical Weapons Findings to U.N.](#)
- [Duelfer Report on Chemical Weapons in Iraq](#)
- [Army Report Says Only 500 Munitions Found in Iraq](#)
- [Senate Committee Report Understated The Scale Of Chemical Weapons Recovered in Iraq](#)
- [American Firms' Supplying Iraq's Chemical Weapons Production](#)
- [United Nations Monitoring, Verification and Inspection Commission Report on Iraq](#)
- [U.S. Army Regulations For Treating Chemical Warfare Casualties](#)
- [U.S. Navy Technical Manual on Chemical Munitions](#)
- [Iran Spars with the U.S. and Britain Over the Countries' Handling of Chemical Weapons](#)
- [Iraq's Plan To Entomb Remnant Chemical Weapons In Bunker Complex](#)

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http://www.nytimes.com/interactive/2014/10/14/world/middleeast/us-casualties-of-iraq-chemical-weapons.html?_r=0