Long-term Psychological Consequences among Chemical Warfare Survivors of World War I and their Current Relevance

1. Describe the psychological, social, and cultural ramifications among World War I veterans of large-scale battlefield use of chemical ordnance.

2. Compare the similarities of that cohort to the experiences of recent victims of chemical warfare in Iran and elsewhere.

3. Discuss the nature of chemical attack threat as primarily a psychological weapon.

Edgar Jones, PhD, is Professor of the History of Medicine and Psychiatry at the King’s Centre for Military Health Research, London. Neil Greenberg, MD, is Surgeon Commander, Royal Navy, and Senior Lecturer in Military Psychiatry, Academic Centre for Defence Mental Health.

Address correspondence to: Professor Edgar Jones, King’s Centre for Military Research, Weston Education Centre, 10 Cutcombe Road, London SE5 9RJ; or e-mail edgar.jones@iop.kcl.ac.uk.

In undertaking the research for this article, Professor Jones was supported by a grant from the Economic and Social Research Council and the Ministry of Defence (RES-000-23-1057).

The opinions and views expressed herein are those of the authors and do not reflect the official policy of the Royal Navy or the Ministry of Defence.

Dr. Jones and Dr. Greenberg disclosed no relevant financial relationships.
Gas was the truly novel element of World War I. A range of toxins were used (principally chlorine, phosgene, and mustard gas), delivered by a variety of methods, including cloud, shell and mortar. Production of chemical weapons grew progressively and, as a result, increasing numbers of servicemen were exposed to poison gas as the war drew to a close. Although the box respirator, introduced from the summer of 1916, protected the windpipe and lungs from all toxins used in the war, many suffered from the vestigial effects of mustard gas for which, in the absence of special clothing, there was no adequate defense. Yet the numbers killed by chemical weapons were relatively small as a percentage of total deaths: an estimated 6,060 U.K. troops, which was about 1% of the total. For the U.S. Army, it was calculated that of the 34,249 immediate deaths of soldiers on the battlefield, only 200 (0.6%) were from gas. However, of 70,552 U.S. servicemen exposed to chemical agents and admitted for treatment, 1,221 (1.7%) died in American Expeditionary Force (AEF) medical units.

Despite low mortality rates, gas casualties were numerous, being the second largest category (31.5%) of patients admitted to AEF hospitals after gunshot wounds (33.4%). In part, these figures reflected the capacity of gas to traumatize soldiers. Indeed, some units exhibited outright panic when subjected to chemical attack. Inexperienced troops were considered more vulnerable than units that had habituated to this new form of warfare. Clark showed, for example, that in July 1918 the U.S. 26th Division suffered four times as many gas casualties than the battle-hardened French 39th Division, although both units had been exposed to similar quantities of chemical agent. Lack of knowledge about different types of toxins and their specific effects added to genuine anxieties. Soldiers traumatized or mentally exhausted by the effects of prolonged warfare often misinterpreted the nature of bombardments and assumed that they had been poisoned by gas. Powerful emotions inspired by chemical weapons not only had an impact on servicemen’s beliefs about damage to vital organs and long-term health but also influenced the number and range of symptoms that they reported.

**BATTLEFIELD RESPONSES**

First, it is important to draw a distinction between those who were severely gassed and suffered life-threatening physiological effects and those who were minimally exposed and temporarily incapacitated. One of the first systematic surveys of gassed servicemen showed that, where it occurred, death was usually rapid and that the 95% who survived the initial phase went on to make a good recovery. With growing clinical understanding, specialist physicians recognized that non-severe cases should recover within 6 to 8 weeks, allowing a soldier then to return to active duty. A significant difficulty identified by Douglas, a physiologist serving with the British Army, was that:

“… we have admittedly to deal with a large psychic element in very mild cases of gas poisoning, and this feature is naturally more prominent in the case of troops who have only a limited experience of gas shelling. Even with such experienced troops of our own, we have to contend with this difficulty — hence instructions to detain doubtful cases of gas poisoning in medical units within the army area until diagnosis is certain.”

Initial diagnosis was difficult because the symptoms of anxiety often mimicked the physical effects of mild exposure to gas. Charles Wilson, a medical officer working at a base hospital in Boulogne, often found in newly admitted patients:

“… a nervous disorder — frequently hysteria — implanted on the physical harm caused by the gas, which in itself was often trivial. When after a few days the bodily hurt had gone, there was left an emotional disturbance like a mild attack of shell shock … it was the mind that had suffered hurt.”

By 1917, military doctors had devised a number of techniques designed to inhibit the accretion of symptoms...
an ocular lesion was healed).9 However, the removal of dark glasses as soon as possible was critical for recovery (see Sidebar 1, page 725, and Sidebar 2).

POST-WAR EFFECTS

A problem of mild gassing was that enduring symptoms tended to be common and non-specific. A 4-year, follow-up study of 188 servicemen who had been exposed to chlorine between April and May 1915 showed that many had the symptoms of irritable heart (palpitations, chest pain, and shortness of breath) without evidence of organic lesion.10 Similarly, an investigation of servicemen who had recovered physically from the effects of phosgene and mustard gas by Meakins and Walker found that one group of symptoms “out-numbered all others, both in frequency and severity, those of the condition called disordered action of the heart or effort syndrome.”11 These were alternative labels for the disorder characterized as soldier’s heart or irritable heart during the American Civil War. A major study of 4,575 British gas casualties discharged from U.K. hospitals between May to August 1918 identified a number of functional symptoms, including photophobia, palpitations, and laryngitis, as responsible for prolonged invalidity.12 By 1919, therefore, it was clear that mild exposure to gas could lead to medically unexplained symptoms and disability. Some physicians went so far as to suggest that such cases could be re-interpreted as “gas neurosis syndrome” because of their similarity “to the non-concussion type of so-called ‘shell shock’ or war neurosis.”13

During the 1920s, it was popularly believed that gassing triggered latent tuberculosis and asthma, an hypothesis first raised by two French physicians, Pinard and Rendu, early in 1918.14 In the United States, a major government-funded study by Gilchrist and Matz was set up to “establish whether any or all of the several gases used during the World War left residua, either anatomical or functional, after a period of approximately eight to ten years.”15 Based on 838 servicemen exposed to chlorine and 1,016 exposed to mustard gas, they concluded that gassed veterans were at heightened risk of chronic bronchitis, although Gilchrist and Matz were unable to control for confounders such as smoking, industrial pollution, and poor quality living conditions. Evidence in the case of irritant-induced asthma, they suggested, was unclear, and many cases were, in fact, misdiagnosed bronchitis.16

Retrospective study of U.K. World War I veterans awarded a pension for the effects of gas found that many gassed servicemen tended to interpret any post-war respiratory event in terms of their traumatic battlefield exposure.17 New upper respiratory tract infections (URTI) served to reinforce beliefs about the harm caused by gas rather than provide a model of recovery and healing. In part, this related to fears associated with chemical weapons but also their systemic nature.18 It was believed that a toxin could be drawn deep into the lungs and spread through the viscera, akin to a pathogen from a plague.19 Likewise, blistering caused to skin and eyes by mustard gas offered tangible evidence to a veteran of what damage a poison might do inside the body.

LONG-TERM EFFECTS

For mild cases, long-term effects appear to be predominantly psychological rather than physical. For example, a 50-year, follow-up study of World War II naval veterans exposed to low levels of mustard gas found no increase in mortality rates.20 Furthermore, an investigation of 111 U.K. veterans, who had volunteered to take part in chemical agent
trials at Porton Down in the 1950s, revealed no evidence of any long-term adverse health effects or unusual patterns of disease. This finding was important as the subjects were a self-selected population, who had presented to the Medical Assessment Program at St. Thomas’s Hospital in London, in the belief that they had suffered enduring damage to their health as a result of participation in medical trials. Another follow-up study of 24 U.S. males who had taken part in mustard gas tests during World War II found that four (17%) had the symptoms of posttraumatic stress disorder (PTSD), which was attributed to the fears raised about 40 years earlier.

RECENT EXPOSURES: IRAN AND IRAQ

Mustard gas was used by Saddam Hussein not only against Iran (casually estimates being as high as 45,000), but also against the Kurds. Although many U.S. troops believe that they were exposed to chemical weapons during the 1991 Gulf War there is, to date, no firm evidence to support this assertion. However, two studies have demonstrated that belief is almost as harmful to health as actual exposure. An investigation of 2,246 U.S. Gulf War veterans who believed that they had been exposed to nerve or mustard gas found that they had also reported more symptoms while serving in the Gulf, were more likely to be diagnosed with a mental disorder, and 10 years later reported poorer current health status. In other words, Gulf War veterans who believe that they had been attacked by chemical weapons were more likely to be symptomatic and disabled than colleagues who did not hold these convictions. A similar finding emerged from a study of vaccines against possible biological weapons such as anthrax. Side effects have been shown to be linked not to the vaccine per se but to the belief that an individual was forced to have the injection. This also is powerful evidence of the difficulty of drawing sharp distinctions between physical and psychological symptoms.

In addition, there are a number of contemporary examples to suggest that the psychological consequences of potential exposure to chemical weapons are far more extensive that can be accounted for by the effects of the poison alone. The “terror” effects of poisonous gas are not limited to military populations. For instance, the release of a small quantity of sarin gas in the Tokyo subway system in 1995 by a terrorist organization killed 12 people but led to the emergency rooms of local hospitals being swamped by more than 5,500 people, of whom less than 20% were found to have suffered any identifiable physical effect. Anxiety about chemical weapons can also have substantial effects on civilians who, on investigation, are not exposed to them. A study of the Israeli population, attacked by between 36 and 40 missiles on 18 separate occasions during the 1991 Gulf War, looked at effects of equipping the population with anti-gas countermeasures. The authors found that in spite of there being no evidence that any of the missiles contained toxins, six of the eight deaths caused by Iraqi SCUD missiles were of individuals who, by failing to remove the plug from the filter of their respirator, were asphyxiated, misattributing anoxia to the effects of poisonous gas. Other investigators have also reported that seven Israeli civilians died as a result of improper use of an official issue of atropine injections. Thus, the fear of gas attacks upon civilian populations can cause death in the absence of any chemical agent, an important consideration for emergency planners.

CONCLUSION

Since their first large-scale deployment in World War I, chemical weapons have lost none of their power to frighten. Like biological weapons, chemical agents touch on a human concern about being destroyed by a potent force that enters the body and is drawn into vital organs where it is free to cause significant and lasting damage. In the past, military personnel were most likely to encounter noxious gases and to suffer as a consequence. Although service personnel receive training in how to protect themselves against such weapons, the current terrorist threat has made civilians pos-
sible targets without as yet resulting in equivalent safeguards. During World War II, the entire U.K. population was issued with a respirator in 1938 and received formal instruction in its use, while decontamination centers were set up in urban areas. It is suggested that these public precautions and the threat of retaliation were important factors in deterring Hitler from dropping bombs filled with chemicals on British cities. However, because of the intense emotions often inspired by gas, the introduction of protective measures alone is not sufficient to address the issue. There remains little doubt that the release of a toxic agent upon a western civil population would leave a significant psychological legacy irrespective of the physical outcomes of those directly involved. However, history also reveals that in spite of the ability to induce fear and terror in those affected, or those who think that they have been affected, the use of poison gas as a weapon is far from straightforward.

REFERENCES
1. Douglas CG. Casualties caused in British forces by gas warfare (The National Archives, hereafter referred to as TNA, WO142/109, 1918), and British Gas Casualties 1915 to 1918 (The National Archives, WO158/123).