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## Enduring beliefs about effects of gassing in war: qualitative study

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### ABSTRACT

**Objectives** To discover the content of enduring beliefs held by first world war veterans about their experience of having been gassed.

**Design** Collection and thematic analysis of written and reported statements from a sample of veterans about gassing.

**Subjects** 103 veterans with a war pension.

**Results** Twelve themes were identified, which were related to individual statements. The systemic nature of chemical weapons played a key part in ideas and beliefs about their capacity to cause enduring harm to health. Unlike shrapnel or a bullet that had a defined physical presence, gas had unseen effects within the body, while its capacity to cause damage was apparent from vesicant effects to skin and eyes. The terror inspired by chemical weapons also served to maintain memories of being gassed, while anti-gas measures were themselves disconcerting or a source of discomfort.

**Conclusions** Chronic symptoms and work difficulties maintained beliefs about the potency of chemical weapons. In the period after the war, gas continued to inspire popular revulsion and was associated with a sense of unfairness.

### INTRODUCTION

The use of gas has been described as an "atrocious method of warfare"<sup>1</sup> and has had long term consequences on exposed servicemen. "I was terrified of gas to tell you the truth," recalled Private John Hall of the Machine Gun Corps, adding "I was more frightened with gas than I was with shell fire."<sup>2</sup> Recent studies of troops in training or civilians attacked by terrorists have shown that chemical weapons have retained their capacity to frighten. Although realistic exercises may do much to encourage habituation, for some such drills are in themselves traumatic. Three studies of US troops on courses on chemical and biological weapons found that 10-20% experienced moderate to severe psychological symptoms.<sup>3</sup> Because civilians often share the fears of their military counterparts, chemical weapons appeal to terrorists and others engaged in asymmetric warfare.<sup>4</sup> The release of a small quantity of sarin gas in the Tokyo subway system in 1995 by a terrorist organisation killed 12 people but led to the emergency rooms of local hospitals being swamped by over 5500

people, of whom fewer than 20% were deemed to have experienced any identifiable physical effect.<sup>5</sup> Issuing the civil population with anti-gas protection is far from risk free, as events in Israel during the 1991 Gulf war showed. Six of the eight deaths that directly resulted from Scud missile attacks were of individuals who had failed to remove the plug from the filter of their respirator and had been asphyxiated, misattributing anoxia to the effects of poisonous gas.<sup>6</sup>

During the first world war, fears associated with chemical weapons were disproportionate to their killing power. In a retrospective study, Augustin Prentiss of the American Chemical Warfare Service estimated that only 4.3% of US gas casualties died compared with 24% of other types of battlefield injury.<sup>7</sup> An estimated 6060 soldiers of the British Expeditionary Force (BEF) died as a result of gas (about 1% of total deaths), though a further 181 000 (3.3% of battle casualties) were admitted to hospital but survived.<sup>8</sup> While there are few long term studies of the physical effects of gas, those that exist suggest that their capacity to cause harm may have been overstated.<sup>9</sup> In the US, a major government funded study by Gilchrist and Matz sought 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."<sup>10</sup> They examined 838 servicemen exposed to chlorine and 1016 exposed to mustard gas and concluded that gassed veterans were at an increased risk of chronic bronchitis, though they were unable to control for confounders such as smoking, industrial pollution, and poor quality living conditions. A 50 year follow-up of second world war naval veterans exposed to low levels of mustard gas found no significant increase in mortality.<sup>11</sup> Furthermore, an investigation of 111 UK veterans who had volunteered to take part in chemical agent trials at Porton Down in the 1950s found no evidence of any long term adverse effects on health or unusual patterns of disease.<sup>12</sup>

Using records from the first world war, when chemical weapons had become an integral part of the main combatants' armoury, we explored the ideas and beliefs held by servicemen exposed to gas but not seriously incapacitated. To focus on the psychological effects of gassing, we excluded those who had severe

disability. It was important to identify a population for whom corroborative evidence existed of exposure but who could be shown through repeated follow-up and mortality data to be essentially healthy.

#### METHOD

The 7800 first world war files held by the War Pensions Agency provided a sample of veterans who had been exposed to gas. The records relate to all diagnoses and included the last cases administered by the agency, referring to the longest lived veterans. The files are, in fact, the only source of detailed follow-up data for gassed servicemen in the UK. While not necessarily representative of all gassed people, the records for these veterans provided an extended period of assessment and included death certificates. Regular medical boards held over periods of up to 60 years enabled us to gather a wide range of statements about perceptions of gas and its effects. Case notes are ordered by date of application within the 13 administrative regions created by the Ministry of Pensions in June 1919. By taking consecutive files for "effects of gas" from each of the regions in proportion to the denominator, we extracted a random sample of 103.

We excluded veterans with severe respiratory illness to focus on those whose ideas and beliefs were not grounded in objective pathology directly related to the war. We included pensioners who had occasional or mild episodes of bronchitis because these were recovering conditions that may have been related to other effects such as smoking, industrial pollution, or

poor housing. Because the search exercise was wide ranging, the 103 subjects in the sample constituted almost all of the gassed servicemen in the archive who did not have long term or severe respiratory illness. Repeated follow-ups during the period between the wars enabled us to exclude veterans who had tuberculosis, chronic bronchitis, or emphysema associated with gassing. A total of 23 pensioners were rejected for this reason or because it was clear from hospital records that the soldier's account of having been gassed was false. Data on mortality confirmed the essential healthiness of the sample as they had a mean age of 82 (range 54-102). Only 11 veterans died before the age of 70, the recorded causes of death being emphysema, cancer of the tonsils, pneumonia, uraemia, pulmonary embolism, and heart disease.

When applying for a pension or presenting to a medical board, veterans were examined by a panel of civilian doctors. Although some doctors had military experience, they were not the specialist physicians who had been deployed to France to treat gassed soldiers with instructions to return as many as possible to active service. On occasion, the panel doctors would refer pensioners for a specialist opinion. At these assessments veterans had an opportunity to say what they believed was wrong with them. Statements either in the form of reported conversations or handwritten notes by the ex-servicemen themselves survived for 60 subjects; no reports could be found for 43. Most of these accounts (61%) relate to the period November 1918 to December 1924, and 95% were reported

#### Themes and their timing

Themes*	No of statements within timeframe					Total
	1918-24	1925-9	1930s	1940s	After 1950	
Continuing illness (58%)	26	7	2	—	—	35
Lose time from work (57%)	18	10	1	3	2	34
Continuing ill health caused by gas (55%)	24	5	2	—	2	33
Damage to chest and lungs (38%)	14	8	—	1	—	23
Health getting worse (32%)	8	8	2	1	—	19
Breathing difficulties (22%)	8	4	—	—	1	13
Need for treatment (20%)	7	3	1	1	—	12
Eyesight problems (17%)	7	—	1	1	1	10
Only able to do light work (13%)	4	1	2	1	—	8
Damage to heart (10%)	5	—	—	—	1	6
Stomach problems and vomiting (10%)	2	4	—	—	—	6
Sensitive to changes of weather (8%)	4	1	—	—	—	5
Need for fresh air (7%)	2	2	—	—	—	4
Headaches (7%)	1	2	—	—	1	4
Nerves and depression (5%)	2	—	—	—	1	3
Heavy sweating (5%)	2	—	—	—	1	3
Sleep problems (3%)	1	1	—	—	—	2
Loss of voice (3%)	2	—	—	—	—	2
Loss of smell (3%)	1	—	—	—	1	2
Loss of weight (3%)	1	1	—	—	—	2
System full of gas (2%)	—	—	—	1	—	1
Bleeding from mouth (2%)	1	—	—	—	—	1
Total	140	57	11	9	11	228

\*Figures in parentheses indicate percentage of subjects who expressed these themes.

between the end of the war and June 1949. We collected data as free text, which was analysed thematically by using the constant comparative method.<sup>13</sup> In essence, free text was read to identify common and recurrent themes relating to ideas and beliefs held by the sample about their experience of being gassed. We repeatedly compared items of data across the dataset and defined categories in relation to each other from which we identified salient issues and key themes. This ensured that themes, differences, and relations between categories were re-examined and confirmed or modified.<sup>14</sup>

Pensions were awarded on the basis of symptoms and signs rather than what a veteran said about his illness. Claims were verified by reference to military medical cards and hospital records. While it is accepted that a veteran applying for a pension was likely to emphasise the deleterious effects of gas, there was no suggestion that statements drawn from the sample were falsified. Many claims were rejected for this reason so the accounts in the sample are those that withstood scrutiny over a protracted period. It is important to find out what these veterans believed was wrong with them, what they thought had caused these effects, and which aspects of their ill health they chose to emphasise. An investigation by Meakins and Walker of servicemen who had recovered physically from the effects of phosgene and mustard gas found that one group of symptoms "outnumbered all others, both in frequency and severity, those of the condition called disordered action of the heart or effort syndrome."<sup>15</sup> Pensioners, for example, who had been given the label disordered action of the heart might plausibly have chosen to emphasise ideas and beliefs about serious cardiac disease.

## RESULTS

We identified 228 statements from the 60 veterans for whom we had data. The length and number of their statements varied; some wrote lengthy documents while others submitted single line responses. The timing of their presentation reflected the operation of the pension system: frequent boards in the aftermath of the war with lesser levels of contact thereafter when the men were judged to have stabilised (table).

Three themes were repeatedly expressed by different individuals or by the same person on several occasions: that the person had an enduring illness (expressed by 58% of those who recorded statements), that continuing ill health had been caused by gas (55%), and that effects of gas poisoning were so severe as to lead to a considerable loss of time from work (57%). Allied to these core themes were three associated beliefs: that chest and lungs had been damaged (38%), that their health was deteriorating (32%), and that a medical intervention was needed (20%).

These themes can be illustrated by the following statements: "I have been getting gradually worse every year . . . Also that my system is full of gas" (March 1930). "I have now come to the conclusion that instead of the effects of gas wearing off as hoped, it has gradually

overpowered me" (January 1927). "I honestly feel done up and not half the man I should be . . . I have to lose time at work" (May 1923). "I am often ill and cannot always get my breath, and am sure it is by being gassed" (April 1924). The potency of gas was also revealed: "a stuffy feeling in the chest and a feeling of suffocation" (May 1926), "have suffered from loss of voice on several occasions, which I am of the opinion was caused by being gassed on active service" (March 1924).

Associated with these themes were beliefs that the person needed to breathe fresh air as much as possible (four cases) and could undertake only light manual labour (eight cases). Among some of the more intriguing statements were the suggestion that exposure to gas robbed the person of the sense of smell (two cases) and that it made the individual more sensitive to changes of weather (four cases). Surprisingly, the psychological consequences of being gassed were scarcely mentioned, "nerves" and depression being recorded by only three veterans.

That these were genuine beliefs is supported by consistency of reporting. Several servicemen make the same point at successive assessments. In May 1924, a pensioner wrote, "I am suffering from gas, which is causing me great pains in the chest every now and then [from] the latter part of 1919." A month later, he stated, "I am particularly troubled every spring with cough, which gets worse every year since 1919." In April 1925, he added, "I am often ill, and cannot always get my breath, and am sure it is by being gassed."

In general, this group of veterans believed that the effects of chemical weapons were irreversible, potent, and debilitating. These conceptions stood in contrast with the objective measures of health recorded for individuals in the sample and general observations made by specialist physicians. This raises the key question, why did these veterans take such a pessimistic view of their health?

## DISCUSSION

### Traumatic memory

The statements themselves offer clues as to why gas was so frightening and had such a lasting effect on men's minds. Unlike a bullet or piece of shrapnel, which could lodge in the body and be removed surgically, gas was systemic. A toxin could be drawn deep into the lungs and spread through the viscera, akin to a pathogen from a plague.<sup>16</sup> The visible damage caused by mustard gas (a vesicant or blister agent) to the skin and eyes offered tangible evidence of what a poison could do inside the body. For many veterans the gas had become an integral element of themselves. In contrast with shrapnel, the chemical agent had no definite physical limits and no operation could remove it. Once absorbed within their respiratory system, they believed that gas would continue to damage their health and rob them of the capacity to perform any form of work that required heavy breathing. Some deliberately sought employment out of doors to ensure a ready supply of fresh air.

**WHAT IS ALREADY KNOWN ABOUT THIS TOPIC**

Chemical weapons exercise considerable psychological effects beyond their capacity to kill and wound

Those exposed to chemical weapons, or even the threat of them, often experience chronic adverse health effects

**WHAT THIS STUDY ADDS**

The systemic nature of chemical weapons plays a crucial part in establishing ideas about their potency and long term consequences

The powerful emotions attached to the exposure itself inspire strong beliefs that frame interpretations of subsequent ill health

During the war itself, gas was one of the most feared weapons. It inspired emotion out of all proportion to its ability to kill or wound. In part, this related to surprise deliberately exploited by combatants. With the introduction of the gas shell in February 1916, a toxin could be delivered anywhere within artillery range. Habituation and the adoption of coping strategies were hampered by continual refinements in chemical weapon technology. Each toxin had specific properties, demanding different forms of treatment and different protective measures. Knowledge, even among the medical corps, remained perfunctory.

Some anti-gas devices, in particular the respirator, led to limited vision and made breathing a conscious effort.<sup>17</sup> In 1915 some troops tore off their masks because the unfamiliar smell of impregnated chemicals designed to neutralise phosgene and chlorine had been misinterpreted as gas. As a result, Surgeon General Pike ordered regular drills to accustom soldiers to the claustrophobia and "slight irritation."<sup>18</sup> Even during the 1991 Gulf war several servicemen became so anxious that they hyperventilated when chemical alarms sounded and were unable to wear the respirator that would have protected them from any toxic agent.<sup>19</sup>

**Beliefs and symptoms**

Recent studies of US veterans exposed to the threat of chemical weapons have shown that both symptoms and the memory of alerts in war zones are important in establishing and maintaining beliefs about being poisoned. In 2006, it was reported that 64% of a sample of 335 US veterans of the Gulf war believed that they had been subjected to chemical weapons compared with 6% of 269 service personnel controls who had not deployed to the conflict.<sup>20</sup> In support of this assertion, servicemen cited the experience of an alert while in the Middle East and enduring physical symptoms. Furthermore, a study of 2246 US 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 reported poorer current health status.<sup>21</sup>

All of the veterans in our study experienced enduring symptoms.<sup>22</sup> These were in general somatic and mostly focused on the respiratory and cardiovascular systems.

Acute respiratory infection immediately after the war tended to be interpreted not as an event in its own right but framed in terms of exposure to gas and regarded as further evidence of its long term effects.

**Conclusions**

L F Haber, son of the Nobel Laureate Fritz Haber (1868-1934), who had developed chlorine as a military weapon, argued that veterans who had survived the experience of being gassed and ascribed new illnesses to this exposure served to maintain "the special anxiety created by chemical warfare" in the public's consciousness during times of peace.<sup>23</sup> The fact that many smoked or worked in polluted industrial conditions resulted in no shortage of respiratory symptoms to provide evidence for their claims. We conclude from our war pension data that there was an interaction between ex-servicemen's symptoms and beliefs, which began with the traumatic experience of being gassed but was also linked to popular convictions about its potency and systemic effects. The conviction of having been gassed, whether accurate or not, had long term deleterious effects on a person's beliefs about illness and perceptions of health and wellbeing. Our analysis might also assist in understanding the otherwise baffling persistence of ill health experienced by some US and UK military personnel after their deployment to the 1991 Gulf war.

**Contributors:** EJ undertook the research, analysis of the data, and wrote the paper. IP collected the data. SW helped to design the study and commented on various drafts of the paper. EJ is guarantor.

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