

Gas Warfare During World War One

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Types of poisonous gases

Definition

Gas warfare is a weapon designed to cause casualties primarily through the use of harmful chemical agents. The First World War constitutes the first and most extensive incidence of gas warfare in the 20th century. Poisonous gas remains associated in the public's memory with the horrors of trench warfare.

Influence in World War I

The advent of gas warfare compelled nations to integrate a new method of war into their existing military organizations and doctrines. At times seeking to maximize the element of surprise or, alternatively, opting to create sustained hazardous conditions in areas for hours or days, military units in Europe experimented with a variety of techniques for the deployment of gas in combat and fine-tuned the types of targets considered optimal over the course of the war.

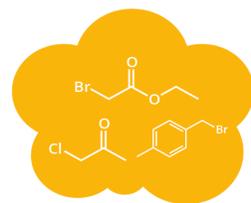
Producing gas weapons and defensive equipment required the creation of supporting scientific and manufacturing institutions, facilitating a diffusion of chemists into business and policy-making fields in First World War nations.

British troops blinded by tear gas at the Battle of Estaires, April 10, 1918.



CHEMICAL WARFARE WORLD WAR I

WORLD WAR I IS SEEN AS THE DAWN OF MODERN CHEMICAL WARFARE, WITH A VARIETY OF DIFFERENT CHEMICAL AGENTS BEING EMPLOYED ON A LARGE SCALE, RESULTING IN APPROXIMATELY 1,240,000 NON-FATAL CASUALTIES, AND 91,000 FATALITIES. A VARIETY OF POISONOUS GASES WERE USED THROUGHOUT THE CONFLICT, WITH EACH HAVING DIFFERING EFFECTS UPON VICTIMS.



TEAR GASES

(ethyl bromoacetate, chloroacetone & xylyl bromide)

SMELL & APPEARANCE

Both ethyl bromoacetate and chloroacetone are colourless to light yellow liquids with fruity, pungent odours. Xylyl bromide is a colourless liquid with a pleasant, aromatic odour.

EFFECTS

Tear gases are what is known as 'lachrymatory agents' - they irritate mucous membranes in the eyes, mouth, throat & lungs, leading to crying, coughing, breathing difficulties, and temporary blindness.

FIRST USED

1914 In August 1914, the French forces used tear gas grenades against the German army, to little effect.

ESTIMATED CASUALTIES

0 These gases were used to incapacitate enemies rather than to kill; symptoms commonly resolved within 30 minutes of leaving the affected area.



CHLORINE

SMELL & APPEARANCE

Chlorine is a yellow-green gas with a strong, bleach-like odour. Soldiers described its smell as 'a distinct mix of pepper and pineapple'.

EFFECTS

Chlorine reacts with water in the lungs, forming hydrochloric acid. It can cause coughing, vomiting, and irritation to the eyes at low concentrations, and rapid death at concentrations of 1000 parts per million.

FIRST USED

1915 Used by German forces at Ypres in April 1915. British forces used it for the first time at Loos in September.

ESTIMATED CASUALTIES

>1,100 Chlorine was devastating as troops were initially unprepared to deal with it. Later, gas masks limited its effectiveness.



PHOSGENE & DIPHOSGENE

(carbonyl dichloride & trichloromethane chloroformate)

SMELL & APPEARANCE

Phosgene is a colourless gas with a musty odour comparable to that of newly mown hay or grass. Diposgene is a colourless, oily liquid.

EFFECTS

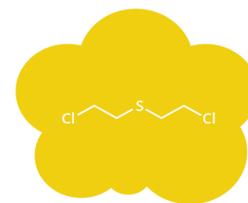
React with proteins in lung alveoli, causing suffocation. Cause coughing, difficulty breathing and irritation to the throat & eyes. Can cause delayed effects, not evident for 48hrs, including fluid in the lungs & death.

FIRST USED

1915 In December 1915, the German forces used phosgene against the British at Ypres.

ESTIMATED CASUALTIES

85% It's estimated 85% of all gas-related fatalities in World War I resulted from phosgene and diposgene, which were both used to fill artillery shells.



MUSTARD GAS

(bis(2-chloroethyl) sulfide)

SMELL & APPEARANCE

When pure, mustard gas is a colourless and odourless liquid, but it's used as a chemical agent in impure form. These are yellow-brown in colour and have an odour resembling garlic or horseradish.

EFFECTS

Powerful irritant and vesicant (blistering agent) that can damage the eyes, skin & respiratory tract. Causes chemical burns on contact with skin. Forms intermediates that react with DNA leading to cell death.

FIRST USED

1917 On 12th July 1917, German forces used mustard gas against the British at Ypres.

ESTIMATED CASUALTIES

2-3% The mortality rate of mustard gas casualties was low, but its effects were debilitating, and patients required elaborate care.

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For further information & references, see www.compoundchem.com/2014/05/17/chemical-warfare-ww1/



“Gas! Gas! Quick, boys! - An ecstasy of fumbling,
Fitting the clumsy helmets just in time,
But someone still was yelling out and stumbling
And floundering like a man in fire or lime. -
Dim through the misty panes and thick green light
As under a green sea, I saw him drowning.”

--- Dulce Et Decorum Est by Wilfred Owen

Estimated Gas Casualties (Killed and Wounded) for Nations with Reliable Data

Nation	Gas Casualties
France	130,000
Germany	107,000
United Kingdom	186,000
United States of America	73,000
Total	496,000

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Michaelmas Term, from Sept. 19, to Dec. 21, 1914
Lent Term, from Jan. 9 to March 31, 1915
Easter Term, from April 1 to June 17, 1915

I cannot tell you what we use to chloroform the enemy, but if you wish to be instructed in the higher branches of the science I would say that Fritz tickles our nose, eyes, lungs, cuticles, etc., with such things as phenyl carbylamines, chloride, brommethylethyl ketones, xylyl bromide... and perfumes of a similar nature. I might mention that we have almost had some casualties through attempts to pronounce such stragglers as the above.

---N. A. Qua

Work Cited

Faith, T. (2018). Gas Warfare | *International Encyclopedia of the First World War (WW1)*. [online] Encyclopedia.1914-1918-online.net. Available at: <https://encyclopedia.1914-1918-online.net/article/gas-warfare>
Compound Interest. (2014). *Chemical Warfare: Poison Gases in World War 1 | Compound Interest*. [online] Available at: <https://www.compoundchem.com/2014/05/17/chemical-warfare-ww1/>