WWI Chemical Weapons
1918 Influenza Pandemic
Medical Aspects of Chemical Warfare

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http://www.cs.amedd.army.mil/borden/Portlet.aspx?id=d3d11f5a-f2ef-4b4e-b75b-6ba4b64e4fb2
The War of the Nobel Chemists

Walther Nernst

Fritz Haber

Victor Grignard
WWI Chemical Warfare

Timeline:

French EtBrOAc grenades
Nernst, Tappan shells
Chlorine (cyl. gas)
Nernst, Tappan shells
Aug 1914
1915
1916
1917
1918
Vesicants/Blister agents
Pulmonary agents (choking agents)
U.S. declares war on Germany
mustard
diphosgene
phosgene
lachrymators/tear gas
Aug Nov
Early Delivery Methods: Gas Cylinders

A French cylinder attack on German trenches in Flanders.
Photograph: Chemical and Biological Defense Command Historical Research and Response Team, AberdeenProving Ground, Md.
Advanced Delivery Systems

Livens projector

Stokes mortar

Photographs: Chemical and Biological Defense Command Historical Research and Response Team, Aberdeen Proving Ground, Md.

U.S. Chemical Warfare Involvement

US soldiers receiving instructions from French officers in early 1918.

US Signal Corps photographs
U.S. Chemical Warfare Involvement


Filling 75mm shells with mustard, Edgewood arsenal. Photograph: Chemical and Biological Defense Command Historical Research and Response Team, Aberdeen Proving Ground, Maryland.
Influenza 1918

PBS America Influenza 1918 Video
1918 Influenza

- 25-50 million deaths worldwide
- 675,000 Americans died
- ~43,000 mobilized American servicemen
- Estimates: 50% of population infected, 30% became ill
- 2.5% mortality
  (seasonal influenza = 0.1%)
Spread of Influenza 1918

March 11 Camp Funston, KS
March 4 Camp Funston, KS
April: France (Allies and German soldiers)
May: Spain, Italy
Spread of Influenza 1918

March 4 Camp Funston, KS
April: France (Allies and German soldiers)
May: Spain, Italy

File: Influenza-map.png
Spread of Influenza 1918

March 4 Camp Funston, KS
April: France (Allies and German soldiers)
May: Spain, Italy

June: Bombay, Calcutta
July: China, New Zealand, Phillipines
March 4 Camp Funston, KS
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July: China, New Zealand, Phillipines

August: 2\textsuperscript{nd} wave begins
Fort Devens, MA 1918

- Aug. 20: Maj. Gen Henry McCain-
  12th Infantry division to be ready in 14 weeks
  -camp built for 35,000 has 45,000 (5,000 under canvas)
- Sep. 7: 1st soldier with flu symptoms
- Sep. 10: 142 hospital admissions (31 on Sep. 2)
- Sep. 18: 1,176 hospital admissions (6,674 cumulative)
- Sep. 23: 12,604 total diagnoses, 63 die on that day,
  -90 would die on worst days
- Sep. 30: 1,902 cases of pneumonia under care
  -hospital designed for 2,000 now has 8,000 patients
  -300 nurses; at one point 90 are sick
1918 Influenza
Societal Impacts

Seattle, WA
Influenza Mortality: 1918 versus Preceding 7 years

Death Rates in the U.S. by Month (per 1,000 population)

U.S. Centers for Disease Control data
Influenza Mortality: Effect on Average life expectancy in the US

U.S. Life Expectancy 1900-1930

U.S. Centers for Disease Control data
Influenza Mortality by Age

U.S. Centers for Disease Control data
1918 Influenza Impacts

Flu orphans, Nushagak, Alaska. (Alaska State Library photo)
Influenza Virus

1933- Smith, Laidlaw and Andrewes transmit influenza to ferrets
1938- Salk and Francis develop first influenza vaccine

Orthomyxovirus
negative sense ssRNA genome
8 segments
Influenza Virus:
Resurrection of the 1918 strain

U.S. Army Institute of Pathology
archived tissue sections

• H1N1 serotype

1997, Ann Reid & Jeffrey Taubenberger
Influenza Virus:
Resurrection of the 1918 strain
Influenza Virus:
Resurrection of the 1918 strain

Terrence Tumpey, US CDC
2005 Reconstruction of the 1918 strain using reverse genetics
References


Childhood Exposure/Cohort Immunity Model