

Mail Handling in the age of Bioterrorism



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Introduction

This page contains extensive information on safe mail handling techniques for individuals, small businesses, corporations, and other organizations as well as information on protecting against other forms of bioterrorism. While it started out with information on protecting against anthrax in the mail, this page now has information on many other biological agents, who has them, how they get them, when they have used them in the past, when and where they are likely to use them in the future, and how to protect yourself against a variety of attacks.

This page advocates a combination of relying on government emergency personnel and self reliance. When appropriate emergency personnel are available, they should know more about handling such emergencies than you will after reading these pages. But emergency personnel will not always be available when you need them. You may receive an attack (or hoax) at the same time that many others are receiving real attacks, decoy attacks, or hoaxes. Or you may live or work in an area where adequately trained emergency personnel do not exist nearby. Something like 40% of all public health departments did not even have touch tone phones, let alone internet access. This page also describes some improvised equipment. This equipment is not likely to afford the same protection as expensive properly designed and manufactured equipment. In some cases, it could just provide a false sense of security. But in many cases where budgets are limited but you have some fabrication skill and common sense, improvised equipment could be much better than no equipment. I wouldn't, for example, do regular biological research on dangerous agents in an improvised BSC (Biological Safety Cabinet) but opening mail in such a cabinet is much safer than doing so without any special equipment (although proper use of an ordinary pressure cooker would be more effective protection for home or SOHO use).

A single letter can easily contain a million times the lethal dose of anthrax. The outside of an envelope processed in a contaminated mail facility could also easily have more than a lethal dose worth of anthrax but the chances of enough anthrax making it into your lungs or through the skin are much lower. If you handle a steady stream of mail which has been processed on contaminated machines at the post office.

I started this page on 2001-10-24, after postal workers were known to be infected but before the US government admitted that mail delivered to homes may contain trace amounts of anthrax, to help fill the information vacuum about handling mail which may be contaminated with Anthrax. This page contains information on handling mail at home or at work.

The initial anthrax bioterrorism attack seems to be over but exercising due diligence is still called for. We may be experiencing a temporary reprieve while the perpetrators lay low to evade capture. There may be copy cat incidents. There continue to be many hoaxes.

The initial attacks were apparently intended to incite fear, not kill. Otherwise, they would not have had warnings that the recipient had been exposed and needed to take antibiotics immediately. These may have been a warning shot fired across our bow; such warning shots are often followed with real shots unless you comply with the warning. These attacks could even have been from "friendly" sources who believe that we are likely to suffer from real attacks in the future and are not prepared. Nonetheless, 5 people have died, there have been 17 confirmed and 5 suspected cases of anthrax, and 32,000 people have had to take antibiotics, and mail delivery has been delayed by over a month. A real attack could come at any time and be much more severe.

Dried Anthrax spores on paper can survive for 41 years. Buried spores have survived for centuries.

This page focuses on Anthrax but also has some information on dozens of other biological, chemical, and radiological weapons. There are three forms of anthrax exposure: inhaled, skin,

and gastro intestinal. This page will primarily be concerned with the inhaled form. Hopefully, you always wash your hands between handling mail and eating and use separate areas for the handling of mail and preparing and consuming food and beverages. Attacks on the food supply are outside the scope of this document. Skin anthrax usually produces black lesions before it is too late to take antibiotics. The precautions described here should, however, provide protection against all three forms of exposure.

ter·ror·ism (tr-rzm)

n.

The unlawful use or threatened use of force or violence by a person or an organized group against people or property with the intention of intimidating or coercing societies or governments, often for ideological or political reasons.



You need to exercise common sense and good judgement to protect yourself and not be a threat to others. In a crisis such as this, other peoples civil rights can easily be violated. Don't go accusing anyone who looks the least bit different from you who wanders onto your premises, for example, of being a terrorist. Don't yell ANTHRAX!!! at the top of your lungs when someone sends you a sample packet of seeds.

Many people have survived biological attacks. Incidents involving the release of biological agents in the last few decades have only involved a handful of fatalities, maxium, per incident. Past events may not be indicative of future events.



Crises such as these pose a considerable threat to civil rights. A population that has excercised gross negligence in preparing for security threats will tend to panic and violate the civil rights of others. To the idiot who leaves his keys in the ignition, anyone who looks a bit different and comes near his vehicle may be regarded as a potential car thief.

Those who would give up essential Liberty, to purchase a little temporary Safety, deserve neither Liberty nor Safety.

-Benjamin Franklin, 1759

"Necessity' is the plea for every infringement of human freedom. It is the argument of tyrants; it is the creed of slaves."

-William Pitt, British Member of Parliament, 1783

Beware the leader who bangs the drums of war in order to whip the citizenry into a patriotic fervor, for patriotism is indeed a double-edged sword. It both emboldens the blood, just as it narrows the mind. And when the drums of war have reached a fever pitch and the blood boils with hate and the mind has closed, the leader will have no need in seizing the rights of the citizenry. Rather, the citizenry, infused with fear and blinded by patriotism, will offer up all of their rights unto the leader and gladly so. How do I know? For this is what I have done. And I am Caesar.

-Julius Caesar

- Airport screening in this country has been a joke. Now, people run the risk of having their bags searched, and their medications, sex toys, negligations, and other private possessions exposed, at airline ticket counters in full view of friends, family members, bosses and coworkers.
- Facility security is totally lacking in many buildings. As a result, anyone who wanders into the lobby of a building for legitimate reasons who isn't a conservatively dressed WASP with short hair can face the third degree.
- Treatment of suspects in the current crisis poses considerable threat to civil liberties. Innocent until proven guilty, unless the crime is a heinous one in which case it is reversed.



- 2002-05-06: [15 Pipe bombs were found in mailboxes](#) in Nebraska, Iowa, and Illinois along with anti-government messages. Six people were injured. The bombs were apparently deposited directly in mailboxes friday and saturday.
- 2002-??-??: It was reported that of over a thousand aliens detained in this country, only two (the shoebomber and the 20th hijacker) have been charged with terrorism. Back in december, however, [93 were charged](#) with various crimes.
- 2002-03-01: UK: 16 toxic packages were sent to British Prime Minister Tony Blair and other british leaders. Apparently the contained a caustic substance disguised as eucalyptus oil.
- 2002-03-01: US/Virginia/Charlottesville: Bomb threat at UVA's cabel Hall
- 2002-02-13: I have run a [computer simulation](#) of an aerosolized liquid anthrax attack on a big box store (Wal*Mart or equivalent). Occupants receive a lethal exposure in an average of eight minutes.
- 2002-02-12: [NOVA special on Bioterror Airs](#)
This closely follows the information in the book Germs. This has video footage of many of the events, people, facilities, equipment, and pathogens mentioned in the book. Available for purchase on VHS, this is the most readily available source of hard to find pictures and footage of this stuff.
- 2002-01-24: [A poll indicated that 1/3 of Americans expect](#) a terrorist attack at the winter olympics in Salt Lake City, UT, US. Twice as many women felt this way as men, which

would give approximately 44% of females and 22% of males felt a terrorist attack was likely.

- [PC Users Enlisted to Find Anthrax Cure](#). This is one of those donate your spare CPU cycles for distributed super-computing deals, similar to those used to crack cryptographic contests. Unfortunately, there are security and privacy concerns for any such effort and one of the partners in this effort is Microsoft, a company known for its total incompetence where security is concerned and its complete and utter disregard for your privacy rights.
- 2002-01-22: [Hart senate office building reopens](#) after 3 months and a \$13.5 million dollar cleanup operation. Scientists will not say that the building is spore free.
- 2002-01-18: Airport bag screening supposedly begins. No, they won't be scanning all bags for explosives for another year. They will be doing bag matching but there are two problems. Bag matching assumes the terrorist is not willing to die; yet 19 terrorists committed suicide attacks in one day (2001-09-11). They only bag match on your first flight, not on connecting flights; all a non-suicide terrorist needs to do is set the bomb to go off during the second flight and not board the second flight. Or put the bomb in someone else's bag.
- 2002-01-16: I open a newly purchased jug of salsa only to find that I was not the first person to have done so. The tamper seal was broken in a manner suggesting it was the result of a human action rather than an improper seal in the first place. It was reported to the FDA as a possible biological product tampering. Although they do not normally do product sample testing in such instances, they have followed up with me, the store (which checked product on the shelves), and the manufacturer. It is probably nothing but it does make me think, even more so than I already have, about the potential vulnerability of the food supply.
- 2002-01-16: A pilot allegedly [threatened to crash his small plane into the tallest building in the Portland, Oregon, US area](#).
- 2002-01-15: [McDonalds closes two stores in Sydney, Australia after receiving white powder in mail](#).
- 2002-01-11: The government of Singapore revealed that 15 suspects arrested in December were affiliated with Al-Qaida and engaged in a plot to ["blow up western embassies, U.S. Naval Vessels, a shuttle bus carrying American soldiers, and the offices of U.S. companies."](#) Some of the targets were to be attacked using boxes containing bombs on bicycles. Embassies to be attacked included the US, Australia, and Israel.
- 2002-01-08: [A man strikes a flight attendant with a shoe, saying that everybody on the plane was going to hell. His carry on baggage contains knives, flares, and lighter fluid](#).
- 2002-01-06: A american teenager (who supported bin laden) [flies a small Cessna 172R plane into a skyscraper](#) in tampa.
- 2002-01-04: The [second Daschle anthrax letter](#) was just a hoax (talcum powder).
- 2002-01-04: Looks like [another postage rate hike](#) is coming.
- 2002-01-03: [U.S. Clamps Down on Anthrax 'Cure' Web Sites](#)
- 2002-01-02: A natural [outbreak of Ebola](#) has killed 22 in Central Africa.
- 2001-12-26: Federal authorities allege that the extremist, anti-semitic, mostly black muslim Muslims of America 44.5 acre "Red House" trailer park compound, housing about 20 families near Appomattox, VA, US is a [terrorist cell](#) with loose ties to al-Fugra. The al-Fugra group, which "seeks to purify Islam through violence", was charged with

firebombing a Hare Krishna temple in 1984 and murdering a Muslim cleric in 1990 and is suspected in 17 bombings and 12 murders. Two members of Muslims of America were arrested earlier on weapons charges and group allegedly bought another 100-acre compound with money obtained from the state through false workers compensation claims. The main street was named after Shayky Mubarik Ali Gilani, the founder of al-Fuqra. This compound is located about 70 miles from Charlottesville.

- 2001-12-22: The body of scientist Dr. Don Wiley was [found after he had been missing for a month. Thing is, he worked with deadly viruses such as Ebola.](#)
- 2001-12-29: [More anthrax found in New York at the](#) Morgan processing center. This machine had tested positive in October but had tested negative since then until a test conducted on Dec 23 came back positive. We don't get the news until at least 6 days after the test and we don't know how long it has been since that machine processed more anthrax tainted mail. But it looks like someone had a little Christmas present for us.
- 2001-12-22: Richard Reid (probably an assumed name) tried unsuccessfully to [ignite plastic](#) explosives in his shoe on an AA flight from Paris to Miami but was subdued.
- 2001-12-17: The US military is not allowing Operation Dear Abby and Any Service Member letters to be sent to troops because of the danger of anthrax. Instead, they are [setting up email.](#) Operation Dear Abby has allowed people to send messages to non-specific soldiers for 17 years. The military was concerned that the program allows mail to be introduced with too much anonymity (gee, sounds like USPS).
- 2001-11-24: [New Bedford High School Massacre Plot](#) involving guns and explosives, was averted in New Bedford, Mass. Five students were arrested for a plot to set off explosives at the school and shoot students and faculty as they fled.
- 2001-10-09: Civil rights alert: Less than a month after the September 11th attacks, probably trying to exploit a political environment favorable to law enforcement and a media and public preoccupied with other threats, the DEA bans edible hemp products despite the fact that HEMP doesn't get you high, is one of the few concentrated vegetable sources of Omega-3 lipids deficient in American diets, and contains such negligible amounts of THC that consumption of large amounts on a daily basis wouldn't cause you to flunk a drug test.
- Censorship Alert: On September 17th, in the wake of the WTC bombing, Clear Channel communications, which controls 10% of the nation's radio stations, [banned about 150 songs](#) with "questionable" lyrics. Banned songs include "Highway to Hell", "Rock the Casbah", "Great Balls of Fire", "Imagine", "Only the Good Die Young", "On Broadway", "Lucy in the Sky With Diamonds", "Hit me with Your Best Shot", "Blowin' In The Wind", "Hey Joe", "American Pie", "Leaving on a Jet Plane", "Ruby Tuesday", "Burning Down The House", "Jump", and even the most requested song in rock history: "Stairway to Heaven".

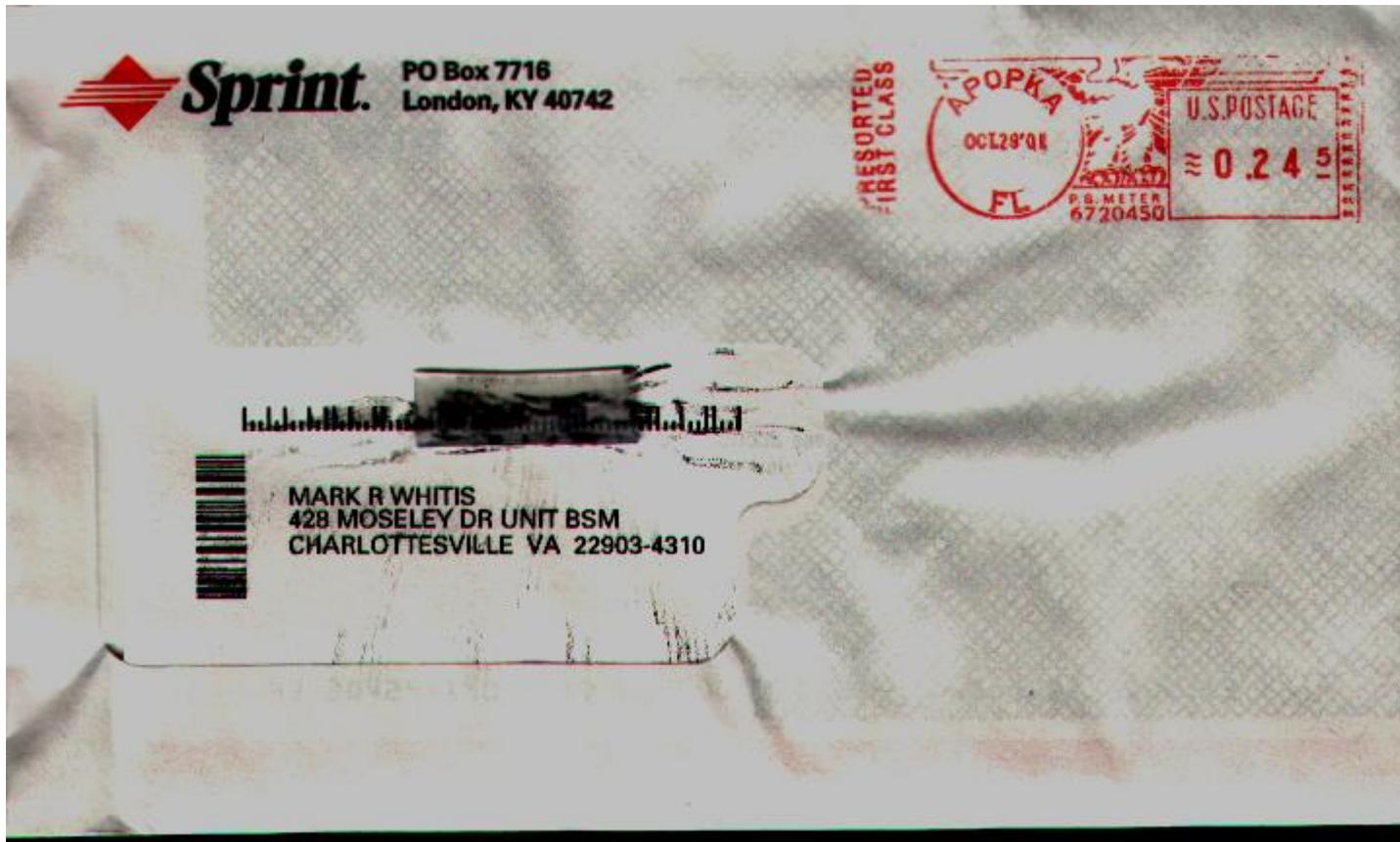


Decontamination Methods



Steam Autoclaving

Since I have an autoclave, I have been experimenting with the effects of autoclaving on various types of mail, and have autoclaved all mail which I have received during the several months since the anthrax attacks began.



The image above shows an envelope (my phone bill, which includes charges for the calls I made on Sept 11th) which has been sterilized using a steam autoclave. The small rectangle over the barcode is the shrunken remains of the plastic window. If you remove the plastic, the bar code may actually still be readable. This bill was the worst damaged piece of paper mail I received in the mail, during the first month of autoclaving, due to the large black areas of low temperature toner. [A page from that bill](#) shows the damage (certain portions have been blurred to obscure confidential information).

Steam Autoclaving in a spore tested autoclave will inactivate anthrax spores. Typical paper mail survives this process. There may be the occasional water spot or in some cases laser toner sticks two pages together but they can be separated and the mail is still readable. Not all mail will survive this process, however. Some articles of mail that might be vulnerable are:

- Not practical for parcels, even if you have equipment large enough, since parcels are likely to contain many things which can be damaged.
- Plastic window envelopes. The plastic window often melts and shrinks to a small rigid piece of plastic less than 1 inch by 1/2 inch. The plastic does not stick to the mail. Cellophane ok? There is some toner transfer to the plastic and sometimes a little smearing

of the toner in interesting ways as the plastic shrinks and often there is a water spot where the window was but so far the text behind the window has always been readable. One envelope that had a huge (almost full size) window only shrank partway before it melted into the paper.

- Credit cards (plastic, magstripe, holograms)
Some warpage. hologram damaged but still visible. Magstripe probably erased.
Embossed card number no longer embossed but still readable.
- Thermal Address Labels (DYMO/Costar, Seiko, Casio, etc.)
Will turn black and be unreadable. Photocopying or scanning the envelope prior to autoclaving will preserve any lost information, such as the name of the recipient within your organization or the name of the alleged sender. All of that information should also appear on the first page of the correspondence.
- Plastic Address Labels
I have encountered one plastic return address label on incoming mail. It shrank to a miniscule size but was still somewhat legible. I would not recommend plastic labels for the To: address.
- Smart Cards
The steam may damage the integrated circuit, encapsulation compound, and/or the plastic card. The moisture may be more of a problem than the heat.
- Photo ID cards
- Plastic membership cards
Plastic overcoating shrank and delaminated. Some warpage occurred.
- Return envelopes
will either be glued shut or the glue will lose its adhesive properties.
- Refrigerator Magnets?
- CD-ROM's
Well, one CD-R held up better than I expected but was still damaged. The disk was slightly warped and the printed surface was readable from the bottom side of the disk where it wasn't before suggesting that the reflective surface which holds the data had been damaged. It is likely that all data was destroyed.
- Business card CD-ROM's
- Thermal fax paper
As expected, this becomes completely unreadable.
- Ink jet print bleeds some but is still readable
- Laser toner was originally melted onto the paper. It may melt slightly and cause pages to stick together with some transfer remaining after pages are pulled apart (similar to the way pages stick to the inside cover of vinyl binders). Pages are still readable. Large areas with a black background may cause some tearing
- Glossy color brochures
unharmed
- Checks
Unharmed. Note: Panasonic used to manufacture an expensive Pocket Check Writing system that might have used thermal checks. It was an expensive gadget and has been discontinued.

- Barcodes
usually unharmed. May have some smudges, bleeding, or toner transfer from facing pages.
- Hot laminated paper cards
Survive ok. Some bubbling in the lamination around the edges of the card.
- Thermal bound reports
It is expected that autoclaving will soften the adhesive in the binding but this is not likely to have ill effects if the document is not under stress at the time.
- Staples
staples are likely to leave small rust stains on the document.
- Diamonds
should not be damaged
- Seeds
will be killed.
- Catalogs, stapled.
unharmed
- Catalog, non-glossy color newspaper style.
Unharmed
- Tyvek
Tyvek not only survives autoclaving at normal temperature/pressure settings but is the preferred covering for surgical instrument packs. Note that tyvek is porous to steam but not to
- Photographs
?

For a large mailroom, a large Autoclave of the sort used for decontaminating medical waste in hospitals would be ideal but demand is likely to exceed supply at this time. Here are some alternatives:

- Food service pressure cooker.
Some of these are quite huge. Operate at 15lbs, make sure all of the air is vented. Purchase a spore test kit or use a third party spore testing service to monitor correct operation.
- Home pressure cooker
A home pressure cooker will work as well as a medical device provided you are very careful in the operation of the device. Use at 15lbs. Use a vegetable steamer basket inside. Be sure to vent the air completely before starting the timer or it will not be effective. Do not allow plastic windows to touch the side walls. Be sure not to run out of water and watch to make sure that you maintain steam pressure the entire processing time.

The more mail, and the less steam can circulate around it, the longer the time which will be needed to autoclave it. Place spore test vials inside an envelope in the middle of a batch of mail to test for effectiveness.

Mail to be autoclaved should be packaged in a paper or cloth bag, not plastic. If plastic is used, you will need to leave one end open and increase autoclaving time and the bag may melt onto the mail.

Before autoclaving you should check for the presence of credit cards; unfortunately, this is likely to involve squeezing and bending the envelope which can release spores and should be done in a glove box.

You may want to digitally photograph the to and from addresses and postmark on each envelope before autoclaving so you can contact the correspondent in the event the mail is destroyed when autoclaving.

Autoclaving destroys all common biowarfare agents. The only infectious agent I am aware of which is not destroyed by autoclaving is bovine spongiform encephalopathy (mad cow disease) which I have been told even survives incineration. Actually, autoclaving at 25PSI for 4.5 hours will apparently inactivate BSE prions.

If the windows on some of the envelopes do not shrink completely, this is a sign of a flaw in your autoclaving procedure, such as inadequate steam penetration to the center of mail bundles.

Pass through autoclaves exist. These have one door on each end. These can be installed through a wall. Mail from the receiving area can be placed in the autoclave by biohazard suited personnel and then removed through the other area in the clean mail sorting area. Some models have interlocks to prevent the door from being opened in the less infected area unless an autoclave cycle has been completed.

Material to be autoclaved should be placed in a paper or tyvek bag or envelope or wrapped in newspaper. This will help prevent spores from being blown out of the autoclave during the venting portion of the cycle before they are sterilized.

Chemical indicator strips or tapes are used to identify if a package of items has been sterilized. These are intended to guard against confusion about which packages have and have not been processed in the autoclave, not to indicate that the autoclave is functioning properly. To verify proper operation, use a spore test vials. Some low tech substitutes for chemical strips: the plastic window on a window envelope, a piece of thermal fax paper, or labels from a thermal label printer (dymo/costar).

You can sterilize mail in an autoclave with far less damage than immersion in water because the steam does not cause the paper fibers to separate and the water evaporates when the paper is removed.

In terms of mail condition, It appears that removing mail immediately after autoclaving is preferable to leaving it in the autoclave and opening shortly thereafter is preferable to letting it cool completely.

10:1 bleach (Sodium Hypochlorite)

Bottles of 10:1 bleach may be useful for decontaminating exterior surfaces of parcels which may have been exposed and mail handling surfaces. It can also be used for 10-15 minutes to wash the skin of individuals who have been directly exposed after showering and washing with soap and lots water.

10:1 Sodium Hypochlorite solutions are reported to inactivate anthrax. That is a ten to one dilution with water of ordinary household bleach. Chlorox Ultra bleach is stronger and should be diluted more. Normal bleach is 5% Sodium Hypochlorite. After 10:1 dilution, it will be diluted to 0.5% Sodium Hypochlorite. Prolonged exposure to 5% bleach is damaging to almost every material known to man including highly resistant substances such as polyethylene and stainless steel. Diluted bleach is still effective as a disinfectant but will do less damage. Do not substitute non-chlorine bleaches; some of them might be effective at appropriate concentrations for those substances others may not work at the dilutions described here or at any dilution.

Contact time is very important for any disinfectant/sterilant.

Bleach which has been sufficiently diluted (we are talking MUCH more than 10:1 here) is not very hazardous to humans. Minute quantities of bleach are used to disinfect non-potable water.

Bleach reportedly disinfects anthrax but does not actually destroy the spores.

Bleach does not remove bodily fluid, grease, and other filth which may harbor pathogens and protect them from the bleach. It works on pre-cleaned surfaces only. Also, the bleach will react with the organic matter consuming the available bleach. There is a product called "Chlorox Cleanup" available at most stores which sell household cleaners which contains 3:1 diluted bleach and a detergent.

Soap and water

Soap and water, lots of water, can help remove anthrax. Washing with soap and water before washing with bleach can be a good idea. Note that soap residue interferes with some disinfectants. The idea here is to mechanically remove the pathogen. What happens to it when it goes down the drain? Also, beware of exposing yourself to pathogens while washing in a non-disinfecting cleaner; wear gloves and take other precautions.

Boiling

According to the GSA, immersion in boiling water for 30 minutes should effectively decontaminate clothing. Note that boiling is not sufficient to destroy some pathogens such as Hepatitis B virus and is not considered a valid sterilization method anymore although it might work on anthrax. Window will shrink about 50% but not completely.

All forms of Mail would likely be destroyed by this procedure.

Sporox

7.5% Hydrogen Peroxide (not the 3% household stuff) is approved as a sterilant so it would probably kill the spores if soaked for 8 hours.

Gluteraldehyde

Overnight soak in gluteraldehyde should actually destroy the spores.

Electron Beam Irradiation

This would only be practical for the high risk organizations with deep pockets. Improperly done, it could just encourage mutations instead of killing the anthrax.

Used to irradiate food and medical instruments. Being tested by USPS. Expensive.

- Paper: turns yellow (which also probable means it becomes more brittle).
- Seeds: destroyed.
- Unprocessed film: overexposed.
- Medical/biological samples sent to lab: destroy
- CDs: undamaged
- Computer disks, video tapes: one report I have seen says they are undamaged another says they are damaged
- Gemstones: discolored
- Pharmaceuticals: may be adversely affected
- Credit Cards: mag strip erased. Smart Card chips may be damaged.
- Thermal fax paper and thermal labels: ???

Sources for this section included:

- [Irradiation article](#) .
- [Effects of Electron Beam Irradiation on Nonfood Substances](#)

chlorine dioxide gas and liquid

Is being used to de-contaminate buildings and mail.

Ethylene Oxide Gas Autoclaves

I suspect these would be effective but haven't researched the matter.

Formaldehyde

Fumigation with formaldehyde has been tried to decontaminate at least one building, not sure of the results. Formaldehyde was used to decontaminate Gruinard Island (Anthrax Island).

Sandia Labs secret formulation

[This article](#) describes a cleaner that is intended for cleaning up after chemical/biological weapons but is relatively safe for office equipment.

Lye

5% lye is commonly used in agricultural settings to decontaminate soil.

Organic Solvents and other Harsh Chemicals

It is possible that organic solvents like acetone and other harsh chemicals could inactivate anthrax, but I have not investigated this possibility. These solvents are sometimes used in labs for disinfection/sterilization but are not approved for use as general purpose disinfectants because they may be too dangerous. Acetone will dissolve xerox/laser printer toner and other inks. Harsh chemicals on the hands can not only adversely affect your hands but these adverse effects can increase your susceptibility to anthrax if you use these chemicals regularly.

Other Disinfectant Chemicals and Processes

Disinfectant	Effectiveness against Bacterial spores
Sodium Hypochlorite 0.01-5%	Fair
Iodophor 0.5-5%	Fair
Chlorhexidine 0.05-0.5%	Poor
Alcohol 70-90% 10-30 minutes Need to reapply due to evaporation to achieve even 10 minute contact time.	Fair
Oxidizing 0.2-3% Hydrogen peroxide	Fair-Good 10-30 minutes
Sporox (7.5% hydrogen peroxide) Overnight	Complete Sterilization
Phenol 0.2-3% 10-30 minutes	Poor
Quaternary Ammonium 0.1%-2% 10-30 minutes	Poor
Aldehyde 1-2% 10-600 minutes	Good
Steam Autoclaving, 15psi, 20minutes or more	Complete Sterilization
Hazardous Waste Incineration (not merely crude attempts at burning which could spread spores).	Complete Sterilization likely
	Complete sterilization likely
Immersion in boiling water for at least 30 minutes	inactivation??? Mail will be destroyed.
Irradiation	sterilization?

Most of the chemical info in this table came from "Selection and Use of Disinfectants", Kenedy, Bek, and Griffin, Nebraska cooperative Extension, [G00-1410-A.](#) .



Bogus disinfection methods



Microwave

You can't control the exposure well enough. And it would take a long exposure to decontaminate the mail but it only takes a couple minutes to set the mail on fire. The microwave dries out the mail quickly in hot spots, lowering the flash point.

Personal Anecdote: once i put a potato in the microwave and set it to 6:00 minutes:seconds. Apparently, I got "60:00" or "66:00" minutes. Anyway, something like 20 minutes later when the smell of potato reminded me to check on my food, I found a flaming potatoe in the microwave. The potato continued to burn even after it was removed from the microwave until it was tossed out the door into the snow. The microwave had removed all the water from the potato, rendering it flammable.

Iron

You would probably have to iron each individual piece of the mail for an hour to have the desired effect and in the meantime, you are pressing on it and causing anthrax spores to spray out the corners.

Oven

Dry heat takes much higher temperatures and exposures than steam to decontaminate. Typical sterilization times in a device designed for dry heat sterilization is a couple hours at 350 degrees. A regular overn, or worse a toaster oven, will have radiant heat direct from the heating coils which can set the paper on fire before sterilization is acheaved.

UV light

The efficacy of UV light against anthrax is not well understood. The CDC does not recommend UV light. Sunlight does adversely affect anthrax in the exterior environment but one of the reasons germicidal UV lights are not trusted is the light may not adequately penetrate the item to be disinfected. Germicidal UV lights may work against anthrax spores in the air when used as part of a well designed filtration system. UV lights which are powerful enough to inactivate anthrax spores can also cause eye damage, sunburns, and skin cancer if they are not shielded. They can also produce ozone. Ozone can be hazardous to breath and a component of smog.

Ozone can also have a disinfectant and deodorizing effect. Note that ultraviolet lights also come in different wavelengths:

- UV-A, 315-400nm, Near UV, long wave UV, "Blacklight"
Does not disinfect. Relatively harmless. Blacklights safe. [Causes delayed tanning which does not protect against sunburn](#)). May or may not contribute to Vitamin D synthesis in humans.
- UV-B, 280-315nm, middle wave UV
Partly filtered out of sunlight by ozone layer in upper atmosphere. Erythema (causes reddening of skin). [Causes DPD tanning which provides some protection against sunburn](#). Causes suntan, sunburn, cataracts, and skin cancer. Contributes to Vitamin D synthesis but overexposure can reduce Vitamin D.
- UV-C, 100-280nm, Far UV, short wave UV
Completely filtered out of sunlight by ozone layer in upper atmosphere. [Germicidal and/or ozone producing](#). Highest Germicidal efficiency around 254nm (mercury vapor lights). Very harmful to living things including humans.

Note that tanning lights can be harmful to the skin and eyes. Newer tanning lights must meet [FDA standards](#) which makes them less dangerous. Older (circa 1980) sunlamps, such as the old GE reflector spot style output mostly UV-B light. Early tanning beds also output a lot of UVB. Some import lamps produced lots of UV-B and UV-C. Newer tanning bed lamps output mostly (95%) UVA; they take longer to tan but are less likely to cause skin cancer or eye damage.

The federal trade commission has this to say about ultraviolet lights marketed to consumers for use against anthrax:

The problem is twofold, "If the ozone is safe enough to meet FDA safety standards, it's too low to do anything. If ozone is high enough to actually kill bacteria, even then there is no proof it could kill anthrax and it's so high that it's unsafe for humans and pets."

- FTC assistant director of consumer protection Heather Hipsley

[SEC Sues Company](#) for stock manipulation regarding bogus anthrax claims for a product called the DeGERMinator. The stock apparently tripped after releasing press releases claiming the product would work on anthrax. The [\\$140](#) device resembles a \$10 handheld battery powered compact fluorescent light with a UV bulb and a modified lamp cover.

Protect-Ion

HyperStealth sells a bogus looking product called [protect-ion](#) which is basically a plastic box with a small amount of chemically treated zeolite lining the bottom over which you are supposed to open your mail. Zeolite is neat stuff but I think this device will mostly offer a false sense of security. There is lots of hype on their site and references to scientific information that simply does not support their claims. They say there is a scientific study supporting that active negative air ionizers will reduce unspecified bioaerosols by 30% to 60%. And this proves absolutely nothing about their passive negative ion generator of unspecified strength. But when you open an envelope which releases 10,000 times the lethal dose into the air, you will be glad to know

that there is a small possibility that this device might be almost as effective as a device that will reduce that to a mere 7,000 times the lethal doses. And their devices are so small that most of the falling particles are likely to miss the device entirely. It would not surprise me in the least if it was demonstrated that a wet towel or a large sheet of adhesive (upside down contact paper) might be substantially more effective. With a wet towel, some precaution would be needed to prevent breeding, of course.

Ultrasonic Sterilization

Ultrasonic cleaners generally do not sterilize. They are good for precleaning medical instruments prior to sterilization and if they are filled with a disinfecting/cleaning solution, they will greatly increase its effectiveness. Ultrasonic disruptors used in sterilization can sterilize very small areas, but they also tend to produce infectious aerosols. Ultrasonic cleaners may be used with sterilization solutions to reduce processing time and there are ultrasonic/hot water jet/detergent sharp jet washers. Generally, we are talking about wet processing as well which is not appropriate for most mail.



In the event of suspected exposure



Stay where you are, move about as little as possible and touch as few objects as possible to reduce the spread. Get someone else to do as much of this for you as possible; the fewer objects you touch the less you spread the spores.

1. Shutdown air handlers, fans, AC, in the immediate area.
2. Leave the area immediately. If spores are likely to be on your person, try to minimize the spread of those spores to other people and areas by moving to a secluded non-critical area with as little as possible to contaminate in it.
3. Seal off the area
4. Call 911 and have them notify the local FBI office as well as local police, rescue squad, etc. FBI has primary jurisdiction.
5. Notify building/company/security
6. Have someone shut down the air handling system for the entire building, if possible.
7. List all people who were in the area.

The authorities may have other instructions.

[CDC Advisory: How to Handle Anthrax and other Biological Agent Threats](#)



Keep mail in the mailroom



Paper Mail, except for checks, can be scanned in the mailroom and the originals disposed of without ever entering the rest of the organizations facility. This helps limit any contamination to the mail room, provided workers themselves do not carry the spores outside the mailroom. After scanning mail can be incinerated in a hazardous waste incinerator or autoclaved. Checks can be scanned and then sent directly to the bank. Scanning and delivering electronically also allows you to centralize mail reception for all your branch offices to a central (or outsourced) mail facility where you can afford to use proper precautions. Studies say it costs \$2 to send the average business letter. Scanning incoming mail should be possible for \$0.10 TO \$1.00 each, depending on type, volume, etc. And you won't need to pay to store it or to electronically "microfilm" it later to save storage fees. 600,000 pages (scanned in black and white mode at 300dpi - 165K each) can fit on a single 100GB hard drive. 3500 pages on a CD-ROM. Full color brochures take up about 1MB each; thats 100,000 pages on a hard drive or 600 pages per CD-ROM. One 19" wide equipment rack full of computers and hard drives can store something like 48 million pages (B&W). A large bookshelf or two would be needed to store the CD-ROM backup copies. That is a mere corner of one room. But paper copies of the same documents would fill 2400 file cabinets. That is 400 rooms, each 10x10, full of file cabinets; or a 40,000 sq/ft building. Rent alone could be several million dollars per year - so the cost of scanning can be offset by two or three years storage cost. Low cost scanners can take a minute or two per scan. High speed scanners with auto document feeders can scan 10 pages per minute. Note, however, that the ADF would be very difficult to decontaminate without destroying it.



Don't use mail in the first place



Payments, bills, invoices, statements, purchase orders, and correspondence can all be sent/received electronically. Ask your correspondents to use electronic forms of communication. Packages can be sent by UPS or FedEx ground service - and those services have much better tracking and require identification for billing purposes making them far less appealing to terrorists. If you do allow someone to send you a package via snail mail, require them to obtain a package authorization number first.

Alternative Modes of Delivery by type of mail	
Material	Alternatives
Payments	ACH, Checkfree
Bills	Open Financial Exchange (OFX)+Plain ASCII via email with GnuPG/PGP signature and encryption with pager notification.

Invoices, Statements	OFX, EDI with GnuPG/PGP signature and encryption
Correspondence	Email with or without PGP encryption
Catalogs	WWW
Credit Cards	FedEx Ground Future: Electronic Delivery of cryptographically signed card keys to your locally purchased smart cart, iButton, USB token, or IRDA PDA.
Parcels	FedEx, FedEx ground, UPS, Airborne Express, etc.
Computer Data	Internet, FedEx, FedEx ground, UPS, Airborne Express, etc.
Books	Electronic Delivery, retail, FedEx ground, etc.
CDs	Electronic Delivery (Ogg Vorbis, MP3), retail, FedEx ground, UPS, etc.
DVDs	Electronic Delivery (DIVX), retail, FedEx ground, UPS, etc.
Postcards	Email/WWW Future: wireless internet digital camera Kiosks. Insert a quarter, pick your card, enter address and message. Poof. It is in their email.
Biological/Medical Samples	FedEx, UPS, regional courier service, etc.



National Strategy: Eliminate USPS entirely



Complete eradication of Snail Mail will require universal access to the internet. At first, this might not seem to be practical. But the USPS wants a \$5 billion dollar bailout. That could buy, for example, 100 million \$50 CIDCO mail stations or about one per US household. The USPS 1997 revenue was \$58.2 billion. That means the cost of delivering mail to and from each american household is about \$582. Far greater than the \$100 annual cost of service for a mail station. Better yet, you can buy an internet appliance for \$300 or a full computer for \$600. Displaced postal workers could be put to work on electronic assembly lines to produce the needed appliances.

In order to eliminate USPS, we need responsible use of email and WWW. Absolutely no pages which are not accessible to the handicapped. Absolutely no pages which are unusable without java, javascript, VBS, or other scripts. No use of PDF when HTML will work. No email attachments or web content in proprietary formats like microsoft word or excel. Personal Certificates and digital signatures will be needed.

Incoming international paper mail could be electronically scanned at a customs facility for electronic delivery and the original incinerated. Outbound paper mail to underdeveloped countries could be printed at the same facilities.

Advantages of elimination of USPS

- Save billions of dollars every year.
 - Mail is actually delivered. Redundant delivery is economically feasible. (The USPS loses 5% of all mail). If mail can't be delivered, you get a bounce notification.
 - Mail is delivered immediately. No waiting for days or weeks.
 - Mail is delivered to you wherever you are. You can get it when you are on a business trip or vacation. You can get it when you are camping or touring the country in an RV. You can get it when you are in other countries.
 - The nations homeless can be housed in the countries decommissioned and decontaminated post offices.
 - Much greater access to information for all american residents.
 - No more anthrax in the mail that can't be traced.
 - No more late fees for late or missed payments. No more spending hours on your bills. Faster collection of debts.
 - No more trips to the post office to buy stamps only to find that counter is closed and the vending machines don't have the stamps you need. No more outdated stamps.
 - No more having to dispose of bushels of junk mail.
 - No more disgruntled postal workers "going postal".
-



Guardian BTA

The Guardian BTA is a \$15K piece of equipment which can test for anthrax. These are scarce and available only to qualified organizations. The test strips are backordered for months. Airborne spore collectors are also available which will collect airborne spores into a small quantity of liquid which can be tested using these test strips. The test strips are antibody based and thus are specific to Bacillus Anthracis.

Hand-held assays (Smart Tickets)

"At this time [2001-10-18], CDC does not have enough scientific data to recommend the use of these assays." The amount of spores required to be detected is 10,000 spores - more than the lethal dose.

Home test kits

There will be home test kits available soon. They don't actually test for anthrax specifically but for an entire family of bacteria and the possibility of false alarms is high. They are not very specific to Anthrax, either. These are might be mass produced smart tickets described above.

There are many bogus home anthrax detection kits being sold.

Future Technology

Newer IC based technologies are under development and are likely to be available in the 1 to 5 year timeframe. These include bonding DNA to integrated circuits, microspectrographs, or microcrystalography techniques. Handheld devices in the \$500 range may be possible using these technologies. Star Trek Tricorders, anyone?

[Cyranosciences](#) has smell digitization technology which it is testing for detection of chemical and biological weapons. It eventually expects to develop NoseChips™;



The US Government has admitted that building decontamination is not likely to eliminate 100% of spores.

Here is how one building is being decontaminated.

Meanwhile, crews have begun working at night to disinfect four lawmakers' offices in the Longworth House office building where traces of anthrax were discovered, Nichols said.

The workers are using a liquid solution of chlorine dioxide, which kills bacteria, and a special vacuum cleaner designed to remove tiny particles. Paper in those offices will be treated with chlorine dioxide gas.

[Source: AP News story at Yahoo](#)

[Another Story](#) goes into more detail.



Don't neglect other forms of security such as computer security and facility security. If you are letting your employees read mail with Microsoft Outlook, browse the web with java and javascript enabled, and haven't locked down your servers, you are toast.

Computer Security

- Install security related patches
- Don't use shitty software. Pretty much anything made by Microsoft is the epitome of insecure software. The more Microsoft programs you use, the more hopeless your situation.
- Disable unnecessary network services
- Do not allow unencrypted remote logins or logins from insecure machines.
- Perform regular virus scanning on all windows machines. Scan all incoming mail and downloads for viruses.
- All organizations should have a firewall
- Do not permit web browsing with java, javascript, active X, VBS, or other scripting or executable languages enabled.
- Do not make web sites that your customers, clients, and collaborators cannot browse without javascript, etc.

Facility Security

All business offices (except for very small SOHOs), all schools, and many not-for-profit organizations should use basic facility security measures like badge readers and intercoms on exterior doors.

Where possible, you should have barriers which prevent vehicles from being driven (crashed) into the building or parked too close to the building. Yes, there are actually ways to even make these inconspicuous. Access to parking garages under buildings should be controlled.

The building main exterior air intake should be HEPA filtered (see section on air treatment).

Outsourcing Mail Handling

Once an organization has reduced the amount of mail which needs to be handled by embracing more sensible means of communication, handling of remaining paper mail can be outsourced to specialized mail handling businesses which open and scan mail in a biological/chemical agent safe environment.

See-through letter spray

Some company markets a product, to law enforcement only, which makes an envelope transparent for about 30 seconds so you can see contents. Not evaluated. However, you can get the same results by spraying the envelope with freon. Radio Shack sells a "CFC free" component cooler which does the trick. Or you can poor rubbing alcohol (which will evaporate quicker than water) on the envelope to make it translucent long enough.



Home (and SOHO) mail handling



Differing mail handling procedures are suggested based on your risk assesment. In all cases, keep you hands away from your mouth while working with mail and turn off any fans or other devices which will disturb the air where you are handling mail unless it would suck released spores directly into a HEPA filter. Do not handle mail in the kitchen.

Low Risk

Who you are: You are not near Washington, DC or New Jersey or another place where anthrax has been discovered. You are not a high ranking government official or celebrity. You are not known widely known outside this country. You do not have an immunnosupressive illness.

Precautions: at this time, you probably face a much greater risk of dying while driving to work than from contaminated mail. There is a risk that you will be exposed to small quantities of anthrax spores on the outside of envelopes but which are not sufficient to cause infection in most cases. Remove mail from your mailbox and place it in a dishpan where you open it. Discard the envelopes. Wash your hands.

Medium Risk

Who you are: You failed one of the tests mentioned above but do not have reason to think anthrax will be mailed directly to you.

Precautions: Wear disposable gloves and a N95 dust mask when handling mail. Place mail in a plastic dishpan. Open and discard envelopes into a sealed trash recepticle (such as a 5 gallon bucket) and place mail in smaller plastic container. Discard junk mail and advertising inserts with mail. Try to handle the outside of envelopes with one hand and the contents with the other to avoid cross contamination.

High Risk

Who you are: There is a reasonable possibility that you could be selected as a non-random target. These precautions may also be appropriate for a small office that doesn't have the resources for more expensive procedures.

Equipment Cost: Under \$100.

Precautions: If you have a mailslot instead of an outside mailbox, it is time to seal the mailslot and get a mailbox. Wear a N95 mask or better. Wear a tyvek labcoat, hospital gown, smock, etc. Place disposable gloves on each hand. Place a couple layers of newspaper in your left hand so the open fold is in your palm. Place a few peices of masking tape on the edges of the newspaper. Head out to the mailbox. Place each piece of mail in the newspaper individually. Check for credit cards, CDs, and other mail which can be damaged by heat by bending each piece of mail you think might contain one very gently without squeezing (which could release spores) any more than you need to. Place any mail containing such plastic items back in mailbox to for special handling later. Letters should be wrapped in newspaper, which can be loosely closed with pre applied masking tape. Place the mail in a steamer basket which has been placed in a large pressure cooker with the appropriate amount of water. Place the lid on the pressure cooker but do not secure. Wipe the outside of the pressure cooker and your gloves with 10:1 chlorox and allow to stand for 10 minutes. Now remove your left glove pinching the outside of the glove near the wrist but not touching your skin and pull the glove off, turning it inside out (infectious side in, clean side out) in the process. Using your right hand, wad up the left glove into the palm of your right hand. Grab the right hand glove by pinching near the wrist with your ungloved left hand and remove as before except this time you are trapping the other glove inside. Place the gloves inside the pressure cooker and fasten lid. Take the pressure cooker inside (removing labcoat before entering) and place on stove and apply heat. Vent for at least 10 minutes to remove air, then place the weight over the opening and adjust heat so it gently rocks. Remove N95 mask. Heat it for at least 30 minutes (don't count time when the heat wasn't high enough to rock the weight). The pressure cooking step can be done outside on a hot plate if circumstances permit. Make sure you do not run out of water. Allow the pressure cooker to cool before removing lid. Verify that the windows on envelopes shrank; if any did not shrink, rearrange mail gently so steam can circulate, add more water, and repeat. If insufficient window shrinkage indicates inadequate sterilization, you should try: processing less mail at a time, separating the mail with something like popsicle sticks to allow steam to get between mail, and cooking for a longer time (you may need more water).

Very High Risk

You are a high ranking governement official, press, or similar target. Don't accept mail at home at all. Have your home mail forwarded to your workplace which should already have strong precautions in place. Doctors who perform abortions would also fall into this category.



Processing Special Mail Articles



CD-ROMs

A computer with a two firewire or USB connected CD-RW drives (one in the sterile area and one in the infectious area) can be used to copy data from a CD-ROM or Audio CD in incoming mail. The original CD can simply be discarded once the data has been copied. The combination of DVD-ROM drive and a DVD-R drive can copy not only copy CDs but DVDs and DVD-ROMs as well. With a flatbed scanner and a special CD-ROM printer, the disk labels can even be duplicated. To copy DVD videos with copy protection, it may be necessary to bypass the copy protection with DeCSS or similar utility. Yeah, the MPAA might argue this is not legal but I would love to see them argue in a court of law that their right to protect their product against alleged revenue loss due to unauthorized duplication outweighs your right to protect yourself from deadly anthrax spores.

Credit cards

Most companies do not need to worry about credit cards in incoming mail unless they are handling personal mail for employees or customers. Credit cards being returned to banks by customers whose accounts have been terminated are not an issue since the mag stripe and embossing do not need to be usable in such a situation and it is still possible to read the number. For personal credit cards, the envelope is unlikely to be contaminated with anthrax even if the outside of the envelope is contaminated; carefully separate the contents from the envelope (four hands work better than two, here). Or have the bank send the replacement card via FedEx.



Anthrax

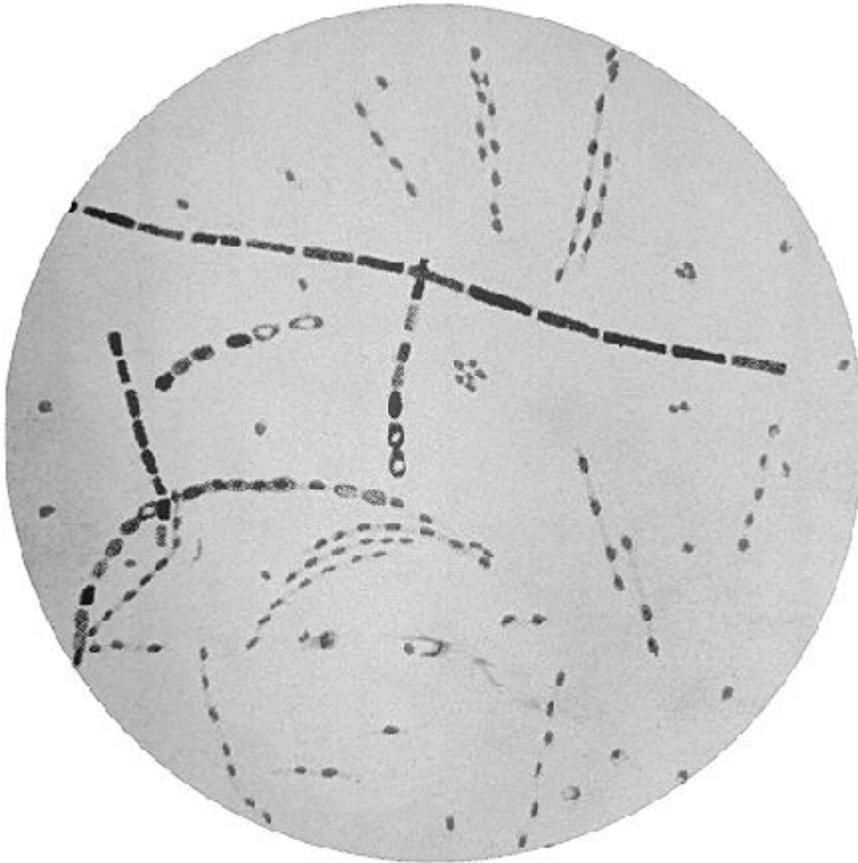


Photo: Anthrax bacteria in Agar Culture (Source: CDC)

About Anthrax

Spore size 2-6 microns in diameter, rod shaped, gram positive, spore forming gram positive bacteria, *Bacillus Anthracis*. These rods, like asbestos, are ideally shaped and sized to lodge in the lung. Crudely manufactured anthrax may be clumped. The LD50 (Lethal dose for 50% of the population) is 8000-10000 spores (note that this number is being revised downward). Inhalation anthrax is 90% fatal if antibiotic treatment is not started before symptoms develop.

Anthrax is believed to be the cause of many massive plagues in ancient times. In the developed world, it has been largely wiped out by public health efforts.

Symptoms of Anthrax infection occur in as little as two days or as much as 8 weeks; usually the symptoms occur in under 1 week. Death follows 1-3 days after symptoms.

Anthrax claimed the lives of two use biological weapons researchers at Fort Detrick back when the US had a BW development program. Anthrax in the mail has killed 5 americans. The CIA

arsenal included 100 grams of anthrax. Iraq used the letter designation "B" and the air force code word "coffee" for anthrax.

Naturally occurring cases in US:

- Florida, 1973, cutaneous
- South Carolina 1974, cutaneous
- California 1976, inhalational, from yarn. Fatal.
- North Carolina 1987, cutaneous
- 1992, cutaneous
- North Dakota, 2000, cutaneous

[CDC Category A.](#)

Links: [CDC BT Page](#), [JHU Center for Civilian Biodefense Studies Anthrax Fact Sheet](#), [OSHA Anthrax Fact Sheet](#), [AMA](#), [WHO Anthrax Page](#)

I believe that the spores form internal to the bacterium and are the dark round masses (that you might guess were the nucleus) visible in high resolution pictures of the bacteria.

[Click here to search for more anthrax pictures](#)

Anthrax Vaccine

The first vaccine ever developed was for anthrax over a century ago. Today, a sterile anthrax vaccine licensed in 1970 is available but it has significant side effects and the US Government controls the entire supply of vaccine. It only offers complete protection for less than two years.

smallpox (Variola Major)

Smallpox Fact Sheet	
Common Name:	Smallpox
Organism	Variola Virus
Organism Type	Virus, enveloped, poxviridae - Orthopoxvirus, Structure: non-seg, lin, dsDNA, complex, env.
Particle size	0.2um x 0.3um
Infectious dose	<100 organisms?
Cause	Variola Virus
Incubation Period	12 days average (7-17 days)
Infectious period	Most infections during the first week but may be somewhat infectious until all scabs fall off.
Disinfectants:	most disinfectants are effective at removing smallpox from hands or hard

	surfaces but these are not the primary means of transmission. Note, however, that smallpox infected blankets did wipe out about half the American Indian Population.
Vaccine	Yes. Crude Vaccin is available, supplies are limited. Maybe given up to four days after exposure. Routine vaccination in the US ended in 1972. Immunity of persons vaccinated before 1972 is uncertain. It will take more than 3 years to build an adequate supply of a modern vaccine to permit universal vaccination.
Symptoms:	High Fever, Fatigue, head and back aches. Rash on face, arms, and legs follow two or three days later. Rash progresses to fluid filled lesions that crust over and then scab.
Duration of infection	3-4 weeks
Mortality	Fatal in up to 30% of cases.
Building Decontamination	The virus inactivates or dissipates in 1-2 days so buildings may already be decontaminated before you know even know there is a problem, assuming that it has not been occupied by infected people in the past few days.
Disinfectants	Bleach: Yes Quaternary Ammonium Compounds: Yes Washing in hot water with bleach: Yes, but garments and linens used by those infected should be autoclaved first. Autoclave: Yes
Environmental testing	tests have not been validated yet.
Treatment:	Not directly treatable more than 4 days after exposure. Vaccination if soon enough after exposure. Antibiotics to prevent secondary infection. Treat Symptoms.
Hosts:	
Spread By	Saliva Droplets/Face to Face contact.
Hospital Epidemiology	For 200 years, separate hospitals were used for smallpox patients. Small numbers of cases can be treated at regular hospitals in HEPA filtered, negative pressure rooms. Laundry should be autoclaved before washing or disposal.
Availability to terrorists	Available to well funded terrorists on the black market.
Spread	As many as 10 to 20 secondary cases from each primary case
Virus Lifetime	In Air: 6 hours at room temperature, 80% humidity. 24 hours at 10 degrees Celsius, 20% humidity. (based on cowpox) Much longer lifetime in scabs (the virus could be isolated from scabs which had been stored on the shelf for 13 years. But virus in scabs is not likely to infect humans.

Affect on those who survive	Permanent disfiguration
History	Vaccine Developed: 1796 (First for any human disease) Eradicated Worldwide: 1971 (except for laboratories)
Biosafety Level	
CDC Classification	CDC Category A
Links	<ul style="list-style-type: none"> • CDC Smallpox Bioterrorism FAQ • CDC Smallpox Bioterrorism Main Page • JHU Center for Civilian Biodefense Studies Smallpox Fact Sheet • MMID - Smallpox Virus (Variola) • AMA • WHO smallpox pages • <div style="text-align: center; border: 1px solid black; padding: 2px; margin: 10px auto; width: fit-content;"> Click here to search for smallpox pictures </div>

There is considerable concern about the possibility of bioterrorists using smallpox. Twenty years ago, smallpox was declared eradicated worldwide and vaccination was stopped and the only two known surviving samples of the virus were in US and Soviet laboratories. These samples were not destroyed because they could be needed in the future to test future vaccines. With the collapse of the Soviet Union, however, it is likely that the smallpox virus has made its way into the hands of a few terrorist organizations and hostile governments. Smallpox is highly contagious and the world supply of smallpox vaccine is not sufficient to protect against a major outbreak. And since people travel more today than when smallpox was originally eradicated, it would be far more difficult to eradicate it again. Smallpox is highly contagious, being spread by aerosol transmission. It was wiped out in this country by universal vaccination. It was wiped out in Africa by a decade long WHO campaign quarantining every individual with smallpox and everyone they had or were likely to come into contact with; this was possible because people there did not travel much. So, why don't we reinstate universal vaccination? We do not have enough vaccine or the facilities to produce enough vaccine in a short period of time. The smallpox vaccine was the first vaccine developed by western medicine and hasn't really been improved since then even though our technology for producing vaccines has improved greatly. Indeed, under ordinary conditions it would not be possible to get FDA approval for the smallpox vaccine since it does not meet modern standards. The vaccine is produced by infecting cows with cowpox, a similar disease, and letting it grow for a while. Then, they scrape the resulting pustules on the cows' hide and use the result complete with pieces of cow hairs and skin cells, as the vaccine. If we vaccinated everyone today, there would be hundreds of deaths from the vaccine. This is small compared to the millions or even billions of deaths which could result from a smallpox outbreak but the probability of a large outbreak is not considered high enough yet.

What should you do if there is a smallpox outbreak? Stay indoors. Put on a N95 mask or even a crappy dust mask or thinly woven cloth if nothing else is available. If every infected and uninfected person wore some kind of mask, even a crude one, it might cut the level of contagion to manageable proportions because the virus would have to travel through two masks to spread. Note that this is not a hard scientific conclusion, just my personal suspicion. Primitive face masks will not stop the virus but they may stop the larger saliva particles which contain them. Also note that both the person infected and the person being protected would need to wear masks so everyone around you would need to wear a mask. Wash your hands before eating. Wash your hands after shaking hands with anyone. Limit your contact. Fortunately, while the disease is highly contagious, it is not very hardy; even mild disinfectants appear to be effective against smallpox when used properly (do maintain the recommended contact time). Visit the CDC website or one of the more reputable news sites for up to date recommendations. Note that the disease may have been spreading for a couple weeks by the time the press reports there is a problem.

Ebola, Marburg, and other Viral Hemorrhagic Fevers



Photo: ebola virus (source: CDC)

Common Name:	Viral Hemoragic Fevers Ebola Marburg Lassa fever
Organism	Caused by Arenaviruses, Bunyaviruses, Filoviruses, and Flaviviruses. Arenaviruses cause Argentine Hemorrhagic Fever, Bolivian Hemorrhagic Fever, Sabia-associated Hemorrhagic Fever, Lass Fever, Lymphocytic Choriomeningitis (LCM), and Venezuelan Hemorrhagic Fever. Bunyaviruses cause Crimean-Congo Hemorrhagic Fever (CCHF), Rift Valley Fever, Hantavirus Pulmonary Syndrom (HPS), and Hemorrhagic Fever with Renal Syndrome (HFRS). Filoviruses cause Ebola Hemorrhagic Fever and Marburg Hemorrhagic Fever. Flaviviruses cause Tick-borne Encephalitis, Kyasanur Forest Disease, and Omsk Hemorrhagic Fever.
Organism Type	RNA viruses enveloped in a lipid covering
Particle size	Particle size reported in different publications as 0.075um x 0.659um and 0.080um x 0.970um to 14um.
Infectious dose	unknown. In monkeys is less than 10 particles by aerosol transmission.
Cause	
Incubation Period	2-21 days.
Infectious period	
Vaccine	none
Symptoms:	
Duration of infection	1-15 days Typically 6-8 days.
Mortality	50% - 90%
Building Decontamination	
Disinfectants	2% sodium hypochlorite (2 parts household bleach diluted with 5 parts water) for 30 minutes and repeat one more time. Or use 2% glutaraldehyde, 5% peracetic acid, or 1% formalin. Steam autoclave. 0.3% betapropiolactone for 30 minutes at 37 degrees C. 2 megarad of gamma irradiation. Heating to 60 degrees C (140 degrees F) for 1 hour. Ultraviolet radiation (if it can penetrate). Triton X-100 (ocylphenol ethylene oxide condensate; Octoxynol 9) . reduces infectivity.
Environmental testing	
Treatment:	Treatment: not very effective. No direct cure. Treat symptoms including maintain renal function and electrolyte balance. Consider Ribavirin although it hasn't been proven effective.
Hosts:	humans, monkeys, chimpanzees, guinea pigs. Some animal (often rodents) other than human or insect is likely to be the natural reservoir.

Spread By	Communicable to health care workers, family members, and others in close contact with infected blood, secretions, organs, or semen. Aerosol transmission has been observed in monkeys.
Hospital Epidemiology	See above.
Availability to terrorists	high
Spread	
Virus Lifetime	several weeks in blood specimens or corpse at room temperature. Does not survive long after drying.
Affect on those who survive	
History	<ul style="list-style-type: none"> • Originated in Africa • Bolivian Hemoragic Fever claimed the life of one US researcher. • EBola-Reston appeared in a primate research facility in Virginia.
CDC Classification	CDC Category A
Biosafety Level	Level 4
Links	<ul style="list-style-type: none"> • CDC BT page . • Ebola Virus MSDS . • <div style="border: 1px solid black; padding: 2px; text-align: center; margin: 10px auto; width: fit-content;"> Click here to search for ebola pictures </div>

Filtration: Should be removed by HEPA filters. Even though most HEPA filters are only spec'ed at 99.97% at 0.3um and the particle diameter is smaller than that, the efficiency should still be 99.9% for 0.080um diameter particles.

Plague

Yersinia pestis. One of history's great killers.

[CDC Category A](#).

Links: [CDC BT page](#), [JHU Center for Civilian Biodefense Studies Plague Fact Sheet](#), [AMA](#)

Yersinia pseudotuberculosis

Formerly called Pasteurella and Shigella pseudotuberculosis Yersinia pseudotuberculosis itself probably wouldn't rate inclusion in this section except for its relation to Plague and to genetically modified E. coli. Although virulent, it is usually self-limiting not fatal in otherwise healthy people; there is a 75% fatality rate, however, in people with Yersinia pestis, which causes plague, is thought to have evolved from Yersinia pseudotuberculosis; the [loss of a gene which produces a protein which binds the bacteria to cell walls](#) created much more mobility in the host. Y. pseudotuberculosis, which shares 90% of the DNA with Y. pestis, has been used to vaccinate against plague, although it is not safe as a vaccine in the immunosuppressed. Rats, the natural reservoir of Plague, may have developed some immunity to Plague because of variants of Y. pseudotuberculosis reducing the natural reservoir for plague and may have contributed to the eradication of Plague. This bug likes cold weather. Infectious dose about 1 billion organisms. Incubation period: 5-10 days. The genome of Yersinia pseudotuberculosis [is being sequenced](#) by the Biological Nonproliferation folks at DOE (LLNL?).

Links: [Y. pseudotuberculosis Fact Sheet at Kansas State University](#), [eMedicine fact sheet](#)

Botulism

Clostridium botulinum and Botulinum Toxin. The Iraqis used the letter designation "A" and their air force used the code word "tea" to refer to this weapon. [CDC Category A](#).

Note that the abbreviation BT can stand for either Bacillus Thuringiensis, Botulinum Toxin, Bio-Terrorism, or Biological Threat depending on context.

Links: [CDC BT Page](#), [JHU Center for Civilian Biodefense Studies Botulinum Toxin Fact Sheet](#), [AMA](#).

Clostridium perfringens

Anaerobic, Gram positive, sporeforming rod bacteria, causes cramps and diarrhea with occasional fatalities due to complications such as dehydration. A more deadly, type C, strain causes often fatal necrotic enteritis. Produces a toxin. This bacterium ["causes gangrene and attacks internal organs"](#). The Iraqis used the alphabetic designation "C" and the air force used the code word "sugar". Iraq declared that it had produced 340 litres of concentrated perfringens toxin? at Al Hakam. They claimed they had also destroyed it; yeah right.

[CDC Category B](#).

Links: [FDA page](#).

Tularemia

Pasteurella tularensis. 20 grams were found in the CIA arsenal.

[CDC Category A](#).

Links: [CDC BT Page](#), [JHU Center for Civilian Biodefense Studies Tularemia Fact Sheet](#), [AMA](#).

Q Fever

Coxiella burnetti. "Q fever" has an infectious dose of 1 as opposed to 8000 for anthrax (fortunately, it doesn't tend to be fatal).

[CDC Category B](#).

Aflatoxin

Aflatoxin is produced by the fungus *Aspergillus flavus*. Iraq had scud missiles and bombs filled with Aflatoxin. Aflatoxin is a potent carcinogen which means the effects take a long time; that pretty severely limits its battlefield use but it could be effective at terrorizing populations.

Agricultural Blights

Agricultural Blights are used to wipe out crops, resulting in economic loss and possibly famine. Wheat Smut is one example.

Anthrax and B. Cereus hybrid

Genetically modified organism created in the Soviet Union. Anthrax vaccine is not effective.

Brucellosis

Brucella suis and *Brucella melitensis*.

[CDC Category B](#)

Links: [CDC BT Page](#), [AMA](#).

Valley Fever

Coccidioides immitis.

Tuberculosis

Mycobacterium tuberculosis. Abbreviated TB.

A [computer model](#) showed that if you are in the same office building but 10 floors away from someone who has TB for a normal 8 hour workday, you have a 33% chance of being infected. Antibiotic resistant strains of TB have evolved which have greatly increased the fatality rate. A 33% percent infection rate in a 1000 person building means 330 people infected in the first generation. They then go home and give it to grandma and baby jane. And the chances of the

remaining 670 occupants of the building remaining infected when 300 carriers of the disease return for the next couple days is not good. A person with TB may feel better after two weeks of treatment but it takes about 6 months to kill all the bacteria. TB causes something like 3 million fatalities worldwide. If you take your drugs for 6 to 9 months, however, the survival rate is 98%. TB is particularly dangerous to people who are HIV+. [Fatality rates:](#) Industrialized countries: 7%, Eastern Europe: 15%, Central and South America: 20%, HIV+: 30%, Untreated: 55%, Treatment cost: \$2000. For multidrug resistant strains, fatality is 50% and treatment cost is \$250,000.

Links: [CDC](#)

Salmonella

Salmonella typhimurium and Chlorine resistant Salmonella Typhimurium were found in the CIA arsenal. This was used by the Rajneeshee cult in Oregon in 1984 (described elsewhere in this document).

Staph and staphylococcal enterotoxin B (SEB)

10 grams of Staphylococcal enterotoxin, which causes food poisoning, were found in the CIA arsenal.

[CDC Category B.](#)

Paralytic Shellfish Poison (PSP)

5 grams of Paralytic Shellfish Poison (PSP) were found in the [CIA arsenal](#). This tetrahydropurine toxin is one of a dozen toxins produced by Gonyaulacoid dinoflagellates. Fatality rates of 8%-14% in natural outbreaks, from eating contaminated shellfish and fish, have been reported in adults but children are even more susceptible (50%). Without treatment, the fatality rate can be 75%, killing within about 12 hours.

Links: [redtide](#).

Bungarus candidas venom

2 grams of this lethal snake venom were found in the CIA arsenal.

Microcysts aeruginosa

Causes intestinal flu. 25 miligrams of the toxin were found in the CIA arsenal.

Camel Pox

Iraq admitted to experimenting with camel pox.

Hemoragic Conjunctivitis

Iraq admitted to experimenting with hemorrhagic conjunctivitis, which causes temporary blindness

Rotavirus

Iraq admitted to experimenting with some form of Rotavirus which cause sever diarrhea.

Cholera

Vibrio cholerae. Iraq was believed to have developed cholera weapons. This one has some personal significance to me since this is one of histories great killers which has not been totally eradicated and there was a cholera outbreak in south america during my first trip there. Infected fecal matter spreads to water and food supplies in the absence of sewage treatment.

Enterobacter cloacae

The Rajneeshe cult had obtained Enterobacter cloacae. Causes internal yellowing of papaya. Can cause treatable disease in humans. 11 children were infected by contaminated prefilled saline syringes at a California hospital.

Links [WHONET Greece info on antibiotic resistance.](#)

E. coli

Escherichia coli is widely present in the environment and the intestines of healthy adults and is usually harmless. There are dangerous, strains. E. coli O157:H7 produces a toxin and causes an estimated 73,000 infections and 63 deaths annually in the US. Causes bloody diarrhea with occasional kidney failure. Sources include undercooked contaminated ground beef, raw milk, and drinking or swimming in sewage contaminated water. It can be transmitted from person to person due to poor hygiene. It lives in the intestines of healthy cattle. Most people recover without treatment.

Genetically modified strains of E. coli were produced in 1973 which was penicillin resistant (not a big deal since you don't normally need antibiotics). In the 80s, a Stanford biologist created a strain of E. coli with a gene from Yersinia pseudotuberculosis. Apparently this was done for research purposes, not military ones.

Links: [CDC](#).

Nipah virus

Giardia lamblia

The Rajneeshe cult considered contaminating the water supply with dead rodents which carry the protozoan parasite *Giardia lamblia* (the cause of Beaver Fever). Symptoms include diarrhea, abdominal cramps, bloating, and gas. Transmitted in feces through poor hygiene. Children who have bowel movements in swimming pools can transmit the disease although the water can be treated after such an incident by superchlorinating the water to 3 to 5 ppm for 30 minutes.

Links: [picture](#), [Maryland Dept. of Health Giardia Lamblia page](#)

Glanders

Actinobacillus mallei and *Burkholderia mallei*.

[CDC Category B](#).

Influenza

Legionnaire's disease

Legionella.

Soviet germ warfare researchers created a modified version of *Legionella* which caused a condition, after the normal illness had passed, called Horror Autotoxosis, a severe allergic reaction in which the immune system attacks its own tissues. Civilian scientists in the US and Italy also accidentally triggered this condition and published the results.

Malaria

Measles

Venezuelan Equine Encephalitis (VEE)

15 people at Fort Detrick became sick with this disease.

Prions

Such as mad cow.

Neisseria gonorrhoeae

The Rajneeshee cult had obtained this.

psittacosis bacteria

Five workers at Fort Detrick were hospitalized in 1968 after a centrifuge broke and spread a fog of this bacteria.

Ricin

This is a protein toxin, 200 times more toxic than cyanide.

[CDC Category B.](#)

Rickettsiae

[Rickettsiae](#) are a class of gram negative bacteria that live inside cells. Among other things, they cause Rocky Mountain Spotted fever. Fort Detrick identified many rickettsiae suitable for germ warfare.

Typhoid

Salmonella typhi

Serratia marcescens

As an experiment, the army sprayed San Francisco with *Serratia marcescens*. Eleven of the patients at Stanford hospital came down with that illness and one died.

Shigella dysenteriae

The Rajneeshe cult had obtained *Shigella dysenteriae*. Less than 100 organisms can cause severe dysentery with a 10-20% fatality rate in healthy adults.

Whooping Cough (Pertussis)

Historically, Pertussis, or Whooping Cough, was a very dangerous disease prior to universal vaccination, often causing death in children, and still is a serious problem in undeveloped countries. Pertussis has been on the increase for the last couple decades in the US; there are 5000-7000 cases per year in the US. Caused by the gram negative bacterium *Bordetella pertussis*, this highly contagious (via aerosol transmission) infection of the respiratory tract causes a characteristic whooping sound when inhaling after a coughing spell. Antibiotics are not useful once the disease progresses to the whooping stage. The coughing spells often cause vomiting. The DTP (or DipTet) vaccine helps prevent Diphtheria, Tetanus, and Pertussis. The protective effect of the vaccine declines over time so adults who had been vaccinated as children may be somewhat susceptible. Some people suffer an allergic reaction to the Pertussis part of the vaccine.

Personal note: there is an outbreak of Whooping Cough in our area and it was even suspected by doctors when my girlfriend and I developed serious respiratory infections.

Links: [CDC](#).

Yellow Fever

tickborne hemorrhagic fever viruses

Fictional Weapons

Either the organisms/diseases or their effects are fictional. At least we hope so. Truth tends to be stranger than fiction. And things in fiction often have a way of coming true later.

Simulants

Bacillus Thuringiensis and Bacillus globigii are innocuous bacteria that have properties similar to Anthrax and are used for testing. Bacillus Thuringiensis is also used as a pesticide. These do not pose a threat. Note that the abbreviation BT can stand for either Bacillus Thuringiensis, Botulinum Toxin, Bio-Terrorism, or Biological Threat depending on context.

Brainpox

From the Cobra Event.

Mutaba

The fictional ebola like disease in the movie Outbreak.



Light table/Light Box

A light table can help identify the contents of an envelope without opening it. Is there a dark shadow in the bottom corners?

A flatbed scanner for a computer with a large transparency attachment may also work either as a standalone light table or the envelope can be scanned digitally and even image processed.

Mailroom Air Handling

Mailrooms should have a separate entrance and air handling. Even if you just block the air ducts (airtight seal, please) and install a window air conditioner, this will help. If you do not have a separate air handling system for the mailroom, there should be a big red switch in the mailroom which shuts down the entire buildings air handling system (actually, not a bad idea even if the

mailroom has its own AC) unless the specific design of the air handling system protects against biological threats. HEPA air filters, or perhaps electrostatic precipitators, should be used inside the mail handling area to remove spores from the air.

Showers and sinks

Mailrooms should have a shower. If not a fully plumbed shower, at least a crude emergency shower. A big plastic tub, some PVC pipe and fittings to make a frame, a few shower curtains, and a shower nozzle hooked up to a sink can be used in a pinch. A 12V bilge pump or 115V sump pump can later be used to drain the plastic tub. Consider water temperature and privacy. A permanent shower with dressing area is best since employees can shower if there is even the slightest suspicion. If there is a high risk of contaminated mail, the shower should be fully functional and used each time an employee leaves the mailroom. A HEPA filtered hot air blower (blowing DOWNWARD) for drying after the shower might also be a plus.

Showers should also have a respirator mask with supplied clean air. An oxygen mask with a high flow rate might be suitable for this purpose. An elastic strap to optionally hold the mask on could also be helpful. The shower is, after all, where you should run if you have just gotten anthrax spores all over your body while not wearing full protection. You will probably want to wash the area covered by the mask while slowly exhaling. Put on the mask and activate the air supply and water and take your first breath (you will unavoidably inhale spores on your upper lip). Remove the mask before exhaling and rinse your face (and perhaps the inside of the mask) before replacing the mask on your face and taking your second breath. Repeat as necessary to clean your face, then breath through the mask while removing your clothing and washing your body and hair.

Likewise, every mailroom should have a sink, preferably one which is operated using at least two of these methods: foot, hand, or motion detector. This permits use without hand contamination, use in the event of a power failure, and use by people in wheelchairs (pay attention to sink height). Disinfecting soaps should be available including something like softsoap (trichlosan), surgical scrub (hibiclens/chlorhexidine gluconate), and chlorox cleanup (10:1 bleach + detergent). Note that mailroom workers should be instructed on proper hand washing procedure.

Gloves

Latex gloves should be sufficient for most purposes. Powdered latex gloves increase the chances of developing latex allergies. Further, the powder contaminates the environment so that the room itself and not just the gloves may be hazardous to someone with a latex allergy. Powder free latex gloves are not as easy to put on and the proper size must be available. With powdered latex gloves, you could stretch a small glove to fit a medium hand. With powder-free gloves, you might have trouble stretching a medium glove to fit a medium hand. Non-latex gloves should be available for those with allergies. Some alternatives include nyllex and vinyl.

Date/Time stamp mail

Mail may not be processed immediately or a biological agent may not be discovered until later. Or, you don't discover an exposure until you sample the filters in your air handlers. Date/time stamping the mail helps to identify those people who may have entered the mailroom since the package was received.

The [DYMO Electronic Date/Time Stamper \(\\$100\)](#) is a handheld device which can print Date, Time, one of 7 predefined messages, and a serial number directly on envelopes or papers.

Access Control

All guests to the mailroom should be escorted to ensure that they do not expose themselves to hazards or inadvertently expose mailroom workers to hazards by failure to follow procedures (even walking too fast can cause air turbulence which can circumvent safety features of biosafety cabinets). All employees and guests must sign (or badge swipe) in and out; in the event that a biological agent is discovered, it will be essential to identify all individuals who may have been in the area. All guests should fill out an emergency contact form the first time they enter the laboratory and sign the visitor log each visit. Glass walls with intercoms will reduce the need for visitors to enter the facility; a glove installed through the glass can even allow for tactile contact when a mail workers significant other drops by to drop something off.

Hazmat Suits

These can range from coveralls to Level A and Level B positive pressure suits. For light duty, tyvek may do. For heavy exposure, a suit which is fully sealed may be needed (but since it doesn't breath, comfort can be a problem).

Improper use of hazmat suits can be dangerous. Suffocation and heat stroke are possibilities. If the suit is not used properly, contamination could enter the suit. Precautions must be taken to prevent contamination when connecting and disconnecting the air supply. What happens when positive air pressure is lost? Do you expose yourself to contaminants when taking the suit off? Is the suit properly decontaminated between uses?

Zippers can be any two - and only two - of the following: cheap, air tight, and strong. If a zipper is both strong and airtight, it is definitely not cheap. A rail zipper (think ziplock bag) is cheap and airtight but not strong, it can accidentally open in use. A normal zipper like you would find on ordinary clothing is cheap and strong but it leaks an incredible amount.

Protective garmets for handling of potentially hazardous mail should ideally zip/fasten in the back, not the front. Anthrax spores and other pathogens can pass right through an ordinary zipper. Unfortunately, it is very difficult to open and close a rear zipper without help from another person (a piece of string attached to the zipper can also help). If you must use one which fastens in the front, tape over the zipper with duct tape.

One of the manufacturers of these suits is [Kappler](#)

Handicapped access

Sinks, showers, entrances and exits, and workstations should be accessible to people in wheelchairs. A separate wheelchair should be provided for use inside mailroom areas which require change of clothes and showering. Panic buttons should be reachable by a wheelchair. After hours security procedures should be available for those who must work hours other than 1st shift either due to a sleep disability or due to working overtime; no directions to simply call the security office which is closed, for example.

High risk facilities

A high risk facility may want to use sealed biohazard suits, forced air respiration, and 100% scanning and autoclave disposal of incoming mail in a sealed biohazard type facility.

Modular Cleanroom Partitions

There are [modular components](#) which can make an airtight cleanroom within a large room.

Intermodal containers

You may wish to build a new mail room outside your building inside an insulated Intermodal Container (those containers you see carried by trucks, trains, and ships, and used for storage). This provides added room and a completely separate airspace. And in the event of major contamination, the entire mailroom can be removed to a government facility. You can centrally create new mailroom facilities for branch offices and ship them to the destination sites and even keep spares in case of serious contamination - a tainted letter need not mean you can't receive subsequent mail. You will need the following hookups: electricity, ethernet (for scanned document pages), telephone, water (optional), sewer (optional). Water tank and sewage tank can be built in. The container can also be divided into two or more separate partitions with an airtight barrier with glove box style access from one section to another. Sections could include: bulk letters in, waste mail out, mail opening/scanning (high risk), clean mail handling, and Parcel handling. Robotic handling of parcels and mail prior to decontamination may be used. Sections could be separated with airlocks or just small apertures through which the mail passes with strong positive air pressure/air flow from clean areas to dirtier areas.

Glove Box

Biosafety Cabinets (BSC)

These provide a non-sealed environment where materials can be handled with reduced exposure to biological agents. They have an open front and use an air barrier, negative pressure, and HEPA filtration to protect. Designed to be easy to clean. You must be careful not to create turbulence. If vented to the outside, a Class II Type B1 or better will help protect worker against chemical, biological, and radiological threats. Chemical agents will, however, be vented outside the building without being neutralized. After use, the cabinet interior is cleaned with a disinfectant and the cabinet and possibly the HEPA filter are optionally exposed to germicidal UV light. For best results, the cabinet should be allowed to run 24 hours per day, with emergency power.

- [UMD Biosafety Cabinet Work Practices](#) .
- [NAPCO Biosafety Cabinets \(Winchester, VA\)](#) . Class B3 BSC \$5400
- [Vendor with price](#)
- [biocompare price comparisons](#).
- [ESCO](#) BSCs and Laminar Flow benches. Class I cabinets around \$2000. Class II cabinets around \$4000. Class III (sealed) around \$7000.

Clean room laminar flow HEPA filtered benches

In the event that there is a shortage of biosafety cabinets, a clean bench might be modified for use. Reversing the fan direction in one of these would provide a reduced exposure work area. When run in reverse, the flow would not be entirely optimal but it will still probably catch the majority of the spores that were released from mail opened on its surface. If you fail to reverse the fan direction, however, it will blow spores right in your face. Note that a normal BSC serves two purposes: to protect people from the biological samples and to protect the biological samples from contamination. A clean bench with the fans reversed accomplishes the first but not the second or with the fan in the normal direction protects the samples but not the people. These cabinets cost about the same as a BSC so you should get a BSC if you can since it is tested for that application and does not need modification. A reversed laminar flow bench may offer comparable protection to a BSC or it may offer more or less. It might offer more because it would only be trying to do one job, protect the user, without compromising for a second job, protecting the samples. They might not work as well because they were not designed to contain the filtered exhaust or to be sterilized in place.

Fume Hoods

Would vent biological agents to the outside without neutralizing them, potentially exposing others.

Autoclave - regular or pass through

Light Box

These can be used to examine the contents of an envelope.

X Ray machine

May be useful in some circumstances for examining suspicious packages. Proper shielding and employee exposure monitoring are needed and operators must be properly trained.

Sound amplification

So you can hear coarser powders move when you tilt an envelope.

Microscope

Calling the authorities and having them make a determination regarding a suspicious substance is better than making an amateur determination. However, there are times you may not be sure whether to call. Or when the authorities are tied up with false alarms. Or if you are located in a remote location the local authorities may simply not be qualified. The more accurately you can determine the nature of the material, the more appropriate the response which can be made. There is a big difference between the response which might be made to "suspicious white powder" and a "suspicious powder which when examined under a microscope contains strands less than 2um wide and varying in length from 6um to 24um which appear to be articulated at 6um spacing".

Ideally, a 2000X optical microscope with a digital camera or video camera and computer connection would be used. This allows examining suspicious powders with the following advantages:

- Putting your nose 5 inches away from the spores to use an ordinary microscope is a really bad idea.
- Putting your nose inside the biosafety cabinet to use an ordinary microscope is a really bad idea. The BSC protects people outside the cabinet, not inside.
- Respirator equipment can make it more difficult to use a regular microscope.
- Images can be viewed by the mailroom supervisor and other personal without any other person entering the potentially contaminated compartment of the mailroom.
- Images can be remotely viewed after the contaminated compartment has been evacuated, if you leave the sample in place.
- Images can be transmitted to the CDC for evaluation.

It might be necessary to add a drop of water and a stain such as methylene [make a thin smear](#) on a microscope slide and allowing it to dry to separate and disperse the spore chains to be able to recognize the spores in a microscope. Whether you can add a disinfectant such as bleach to the water without altering the appearance of the sample, I do not know.

The Intel Play QX3 microscope is a USB digital microscope which sells for \$90-\$200 depending on where you get it. Intel is extremely ambiguous about its specifications but here is what I have been able to determine from other sources: Pixels: 352x288. Resolution at "200X" setting: approx 3.5 um per pixel. To further complicate things, some of the pixels are used for color rather than spacial information. This means that an individual anthrax spore would be less than one pixel wide and about two pixels long. If the spores are clumped, they could be much larger but less identifiable. The spores often connect end to end in long fibrous chains which would be more distinctive. B. Clostridium septicum is [often confused with anthrax](#) because it is a similar size and shape and also forms chains. I think it would be possible to see the chains of anthrax bacteria with this microscope but they could be confused with clostridium septicum, e-coli, or other bacteria since you would not be able to determine the bacteria.

Other possible applications of this device: 1) examine the corners of envelopes (with back illumination) for evidence of powder within; 2) since it is a color device, it might be possible to

use it to take colorimetric readings from antibody based anthrax test strips instead of using a very expensive machine.

Almost any web cam, digital still camera, or camcorder (used with frame grabber) can be used with an ordinary microscope if you can construct, or buy, a bracket or fixture to hold the camera lens the right distance from the microscope lens. Some microscopes have camera connection sites which accept a standard C mount video camera. Kodak and Polaroid make digital cameras intended for use with microscopes. Zarf enterprises makes [microscope adapters](#) for the Nikon CoolPix 900 series cameras. Note that binocular microscopes usually have too low a resolution for this type of work.

In 1200 dpi Flatbed scanners, each pixel is about 21x42um, way too large to image anthrax spores.

Mail handling stations

Esco mail handling station

The ESCO mail handling stations are small 2'x2'x2'\$1000 units made by a manufacturer of BSCs and Laminar Flow Cabinets. Suitable for opening suspicious mail but too small to really confine the bulk of your mail handling to the inside of a BSC.

SafeMail inspection station

[SafeMail](#) is a small HEPA filtered mail handling station.

ISOL-AIDE

[ISOL-AIDE](#) makes mail handling stations (\$2400) that are similar to a class I BSC. They also make pre-fab modular isolation rooms in various sizes. The company made isolation equipment from 92-98 for hospitals to deal with Tuberculosis.

Misonix

[Misonix](#) makes mail handling systems in three widths. No prices or specifications. These fools think you will actually telephone them.

Conveyor fed UV sterilizer

This [piece of equipment](#) sterilizes the outside of envelopes only. It will sterilize individual pages if you feed them one at a time after opening the envelope (and inhaling the anthrax spores). This piece of equipment is more than ten times as expensive as an autoclave but provides much less protection. The equipment is not designed to be mounted through a bulkhead, so anthrax spores can simply travel through the air from the dirty side to the clean side. Computer scan and discard also provides superior protection at a lower price.

Equipment like this could be useful if it was reasonably priced and if two of them bulkhead mounted (with the only opening in the bulkhead in the middle where the UV lights were) connecting three rooms. In the first room, pressure suited employees feed envelopes into the first unit. In the second, pressure suited employees open envelopes (discarding the envelope), and feed the individual pages - as well as brightly colored separator pages (or open manilla file folders that will be used to hold the pages after processing) into the second unit. This type of equipment could also be used if it was inexpensively priced as an addition to autoclaving or to replace ordinary conveyor belts connecting areas of differing levels of contamination.



HEPA filters

HEPA filters for shop vacs are only \$22. This is very cheap for a HEPA filter. Furnace size (but thicker) 20x25x5 filters are \$26 at filtersUSA.com (shitty website). Air cleaner manufacturers: Honeywell, trion, space-guard, aprilaire, honeywell, bryant-carrier, duracraft, holmes, hunter. Trion Air Bear whole house HEPA filter housing for central AC. Sears has many HEPA air cleaners.

Improvised mail handling Cabinets

The walls of such a cabinet can be made out of stainless steel, aluminum, polycarbonate, lexan, formica, or melamine coated board (used for bath/shower stalls), or smooth fiberglass (used for bathroom walls). These have a smooth surface for easy cleaning. For lighter duty where anthrax is not expected, even a large cardboard box can be used for an enclosure (you don't clean, you dispose).

The front of the cabinet should be covered with polycarbonate, lexan, or even flexible garmet vinyl. There should be a gap of only about 8 inches between the bottom of the drape and the work surface. There should be a piece of metal pipe or bar to weight down the bottom of the drape.

There are a number of possibilities for the HEPA filter and fan. A HEPA filtered shopvac or two can be mounted through the roof of the cabinet. This provides an exhaust than can be easily ducted to the outside but is likely to be VERY loud. A honewell envircare HEPA filter can be siliconed into a hole in the top of the cabinet such that its intake is below and the exaust is above. Does not duct to outside easily but is quieter than the shopvac and has a bigger filter. A 20x25x6 inch filter can be mounted below a hole in the top of the cabinet and a window fan mounted above. Silicone rubber or gaskets under compression (this is harder to make work than you might think) can be used to seal around the filter.

Cracks should be sealed with silicone rubber or at least tape.

Two or three sequential HEPA filters are recommended, particularly if it vents to the inside.

An improvised cabinet like this will not have the kind of engineered airflow to minimize the differences in airflow velocities and turbulence.

When working in such a cabinet:

- Work 6-12 inches back from the front of the cabinet so turbulence won't carry particles outside.
- Do not make sudden moves or allow anyone to walk quickly behind you.
- Try to prevent sudden pressure changes like someone moving behind you.
- In the event of a power failure, operate the unit for 24 hours before opening, then clean with a suitable disinfectant while using a respirator. Allow the unit to operate for another 24 hours.
- The HEPA filter/fan should be left on 24 hours a day.
- Filter should be replaced once a year. The filter should be considered hazardous. If you have two sequential filters, safe filter changes will be easier. Before removing the filter, spray the filter with chlorox bleach until soaked, and lower it onto a plastic sheet which it will then be wrapped in and sealed. The second filter can help contain particles while you remove the first. The second filter can be rotated to the first but it may be better to just leave it in place. Used only as a second filter, it should last for a decade.

Letter shaker

Note that this device releases deadly spores from an envelope in a somewhat controlled fashion. This should not be done if you already think there are spores. Call the authorities instead. I cut the corner off a standard cardboard priority mail envelope, about eight inches on a side. Keep the corner and discard the rest of the envelope. Now cut 1 inch off of the right angle corner of this corner and discard the small piece. Now with the corner pointing downward, cut two horizontal slits in the back that will fit over the suction cup like attachment on a coil vibrator like you would find at WalMart (I used a conair model). Use a vice or other means to hold this device or use it handheld. Shine a bright light from the side, slightly forward of where the powder will fall to help illuminate and have a dark background behind where the powder will fall. The whole device should be inside a biological safety cabinet or at least inside a box with a HEPA filtered vacuum exhaust. Connect the vibrator to a foot pedal or external switch (even a plugstrip with a built in switch will do). Place an envelope in the device so that one of the bottom corners protrudes through the hole in the bottom. Now snip the 1/8 to 1/4 inch off the envelope to be tested. Briefly apply power to the vibrator and any powder in the envelope will fall downward and be illuminated by the light. Immediately cut the vibrator off if you see powder. Test using talcum powder, oat starch, or corn starch. The powder can fall into a collection dish, petri dish, or perhaps into the nozzle of a double HEPA filtered vacuum.

Again, I must warn that this device will disperse particles in a very fine dust which can easily be blown around the room with even the slightest draft if some sort of containment and exhaust mechanism is not used.

Sandblasting cabinet

An inexpensive glove box can be improvised using a [small sandblasting cabinet](#). These cabinets are not designed for containing biohazards but if the few holes and air exhaust are sealed with duct tape, they will help contain the anthrax spores. Mail and small parcels may be opened inside the cabinet and inspected, with the aid of the light inside the cabinet, before opening the cover and removing the mail. If you open a letter and find a suspicious powder, do not open the cabinet. Tape it shut with duct tape and call the authorities. Hazmat teams will probably remove the entire cabinet and place it inside a real biosafety cabinet before opening it.

A sandbasting cabinet could also be outfitted with a vacuum hose from a HEPA filtered vacuum with a roof exhaust.



Summary of Recommended Biosafety Levels for Infectious Agents (Source: CDC/NIH BMBL)				
Biosafety Level	Agents	Practices	Safety Equipment (Primary Barriers)	Facilities (Secondary Barriers)
BSL-1	Not known to consistently cause disease in health adults	Standard Microbiological Practices	None required	Open bench top sink required
BSL-2	Associated with human disease, hazard=percutaneous injury, ingestion, mucous membrane exposure	BSL-1 practice plus: <ul style="list-style-type: none"> • Limited Access • Biohazard warning signs • Biosafety manual defining any needed waste decontamination or manual surveillance 	Primary barriers = Class I or II BSCs or other physical containment devices used for all manipulations of agents	BSL-1 plus: autoclave available

		policies	that cause splashes or aerosols of infectious materials; PPEs: laboratory coats; gloves; face protection as needed	
BSL-3	Indigenous or exotic agents with potential for aerosol transmission; disease may have serious or lethal consequences.	BSL-2 practice plus: <ul style="list-style-type: none"> Controlled access Decontamination of all waste Decontamination of lab clothing Baseline serum 	Primary barriers = Class I or II BSCs or other physical containment devices used for all manipulations of agents that cause splashes or aerosols of infectious materials; PPEs: laboratory coats; gloves; face protection as needed	BSL-2 plus: <ul style="list-style-type: none"> Physical separation from access corridors Self-closing, double door access Exhausted air not recirculated Negative airflow into laboratory
BSL-4	Dangerous/exotic agents which pose high risk of life-threatening disease, aerosol-transmitted lab infections; or related agents with unknown risk of transmission.	BSL-3 practices plus: <ul style="list-style-type: none"> Clothing change before entering Shower on exit All material decontaminated on exit from facility 	Primary barriers = All procedures conducted in Class III BSCs or Class I or II BSCs in combination with full-body, air-	BSL-3 plus: <ul style="list-style-type: none"> Separate building or isolated zone Dedicated supply and exhaust, vacuum, and decon system Other

			supplied, positive pressure personnel suit	requirements outlined in text of BMBL
--	--	--	--	--

Note: a separate table covers levels ABSL-1...ABSL-4 for laboratories where infected animals are handled.



HEPA filters

HEPA = High Efficiency Particulate Air. Standards for HEPA filters vary by country and agency. Many are specified at 99.97% for particles greater than 0.3um. Others specify 99.7% for 0.03um to 3um. It may be that filters specified 99.97% @ >0.3um will give 99.7% at 0.03um to 3um but they are not necessarily certified to that level (but they should - see below). HEPA filters must be installed in appropriately designed filtermounts. The filter mounts used in many commercial and industrial applications are likely to leak. The filtermount must seal tightly around the filter. Care should be taken not to tear the filter, particularly at the edges. Filtration efficiency is at specific airflows/pressure drops; exceeding those airflows rates could effect efficiency. HEPA filters are usually pleated to allow more surface area to minimize resistance to airflow and allow longer service life. Filters are typically good for 1 year but large amounts of dust or inadequate prefiltering may reduce that. The particle size that penetrates most effectively is about 0.15um. As particle sizes decrease further, they penetrate less because of increased brownian motion. Apparently, a HEPA filter that tests at 99.97% at 0.3um should have at least 99.90% efficiency at any particle size. A HEPA filter which has been allowed to get wet will have a 40% reduction in tensile strength which makes it more vulnerable to tearing. The performance of multiple HEPA filters in sequence is equal to the product of their individual performances. So, if a single filter gives you at least three nines performance (99.90%) at all particle sizes then two filters gives you six nines 99.9999% or a million to one.

[DOE-STD-3020-97, DOE Standard Specification for HEPA filters](#) specifies 99.97% for particles >0.3um.

[LLNL Criteria for Calculate the efficiency ...](#)

In a small 100 square foot room (800 cubic foot), a person will breath (at 0.5 CFM) in all the air in the room about once per day (roughly speaking). Properly sized (for the room) HEPA air cleaners are designed to produce about 6 air changes per hour (80CFM in this case). So a properly operating HEPA filter will filter about 99% of of polutants out of the air before you

have a chance to breath them. This is assuming they are evenly disbursed and are not been suddenly released in your breathing zone by some activity and that the air cleaner was operating before you entered the room. It also neglects outside air exchange. If the source of contamination is outside air, a typical room air cleaner will only catch about 80% of the pathogen before you inhale it.

Activated Charcoal and Zeolite

Charcoal filters are commonly used to Adsorb bad smells and could be useful against chemical weapons as well.

[Zeolite](#) is a volcanic mineral in microporous crystalline solid which is used for air and water filtration. Among other things, they help eliminate odors. They would probably be useful in adsorbing chemical weapons.

Charcoal and zeolite can be renewed by baking outdoors. The heating releases trapped chemicals.

Respiration

Surgical masks may reduce the risk of inhalation anthrax somewhat. HEPA filtered full face respirators are better. Facial hair may interfere with the fitting of filtered respirators; forced air respirators with air from outside (preferably HEPA filtered) provide more protection.

Don't squeeze the charmin

One of the two postal worker deaths in DC is suspected to be the result of mail being squeezed by machines with rollers causing the spores to be blown out into the mail sorting machines. To make matters worse, the machines were cleaned with compressed air instead of a HEPA filtered vacuum with an outside exhaust. Don't squeeze or shake mail until it is in a glove bag.

Particle sizes

A typical HEPA air filter, such as the round honeywell units often used as room air cleaners, is 99.97% effective at particles 0.3um size. 1um = 1 micon = 1000nm. Home filters are claimed to be comparable in effectiveness to those used in operating rooms and are often used by people with allergies.

Hair	17-181 um
Table Salt	100um
Talcum Powder	10 um
Anthrax spore	1x6 um
Smallpox virus	0.3 x 0.2 um

Ebola virus	0.080um x 0.7-14um
Typical biowarfare agent particle size	1 - 6 um most dangerous ??? 10-17um typical weaponized sizes?
Smallest visable particle	40um
HEPA filter	99.97% at 0.3um Some specs require 99.7% at 0.030um to 3um
HIV virus	0.3 - 0.5 um
Latex glove pore size	???
Tyvek(R) Protective Apparel pore size	6.5um average Stops 70% of particles > 0.5um
Gore-Tex (e-PTFE)	10-30um
Expellable particles (Don't settle in respiratory tract)	<0.5um
Respirable particles (Penetrate to bloodstream)	0.5-7um
Inspirable Particles (Penetrate to bronchioles)	7um-20um
Inhalable Particles (Trapped in uper respiratory tract)	<100um
Fine Dust	0.1-100um
pollen	10-100um
Atmospheric dust	<<0.1um to 100um
Coal dust	<0.1um to >10um
Tobacco Smoke	<<0.1um to >1um
Welding Fume and Dust	<<0.1um to >>100um
asbestos	0.020-0.025um (seems bogus)
Oat Starch	abverage 8-10um diameter
Corn starch	average 22-25um
Very small contageous viruses:	0.018um (Parvovirus B19, Rhinovirus)

Respiration

- Dust masks (such as 3M 8500 Comfort Mask)
These are not rated and pore size information and filtration efficiency info is not available.
- N95 masks
95% efficient down to 0.3 micron
- Surgical Masks
range from unrated comfort masks to 99.97% efficient.

- Professional Cartridge Respirators at hardware store (\$35)
99.97% at 0.3um ? Filter plus activated charcoal.
- Self contained breathing apparatus/SCBA
- continuous supplied air respiration can be hepa filtered or supplied with air from a non-contaminated location and can provide protection without the need to trim facial hair. SCBA is similar to SCUBA.
- Gas masks
These may be effective against chemical and biological weapons. However, the cartridges don't last long. They are meant for short attacks. The shelf life of a filter is limited. Those surplus gas mask cartridges that have been sitting in a russian depot for the last 15 years are expired. No gas mask filters all possible contaminants. Gas masks uses filters, adsorbants, or catalysts. They may be damaged by dropping, getting wet, or prior use. If the cartridges are not kept sealed, they will adsorb from the air while stored and are likely to exhaust the adsorption capability. The cartridge shelf life while kept in the factory sealed bag may be 4-8 years but after the bag is broken it may only be good for a few months.

Note that while OSHA guidelines require passive respirator wearers to remove facial hair in the seal area of a respirator (the US government has a high tolerance for violating peoples civil rights with regard to personal grooming preferences), the [manual for the Israeli civilian gas mask](#) says:

Individuals with full beards may believe that they cannot get a good airtight seal unless they shave - this is a myth! In fact, individuals with full beards are able to obtain a better seal than those who shave, a fact which has been proven time and time again - by the Russians.

Note that this may not apply to other respirator designs; gas masks tend to have a wide seal area where some other respirators have a narrow seal area. This gasmask is good for 5-8 hours under typical conditions. Israel also makes civilian masks which fit children. The military version has larger eyepieces and a drinking tube. Unfortunately, israel has suspended exports. Whatever mask you get, make sure you can get filters for it. Some masks/canisters are interchangeable but they will not necessarily stand behind it if you use another brand filter. You probably want a mask which takes 40mm thread NATO NBC canisters; the M95 cartridge is 99.99% effective at 0.003um. US military gas mask manufacturers include [MSA](#) and [Scott Aviation](#). 3M makes civilian respirators that don't take the same size canister. The military C2A1 spec specifies performance parameters as well as things like color.

Note that some viral diseases, such as the common cold, enter the body [through the eyes](#); the study mentioned suggested equal rates of infection through the eyes and the nose. If you used a respirator that only covers the nose and mouth, you can still be infected through the eyes. Full face respirators or full body suits are better.

Room air Filtration

- HEPA (High Efficiency Particulate Air) 99.97% of particles over 0.3um trapped. Filters are expensive to replace.
- Electrostatic precipitators Cleaned by washing. Larger units self clean using rappers and vibrators which shake collected dust into collection hopper or by water sprays. Some units operate dry, others continuously operate wet to prevent fires and trap condensable VOCs. 99% typical efficiency, not dependent on particle size, for a small off the shelf unit Larger units Can be manufactured up to 99.99% efficient. The longer the filter and the slower the air moves the longer the particle remains in the filter and the more likely it will be trapped. [PPC](#), [Trion](#)
- Cyclone

Positive Pressure vs. Negative Pressure

Controlling the pressure in various rooms, manifolds, ducts, etc. allows you to control leaks so they go from low contamination zones to high contamination zones. Imagine that you have, in this order, a high-contaminated zone, an exhaust fan, a duct through a low-contaminate area, and a HEPA filter. Any leaks in the duct will contaminate the low-contaminate area. On the other hand, if you put them in the order: high-contaminant zone, HEPA filter, duct, exhaust fan. Now the duct is likely to be at a low pressure and any leaks will cause air to leak into the duct. This configuration also has the advantage that HEPA filter is placed as close as possible to the source of contaminants. This keeps most contaminants out of the duct, out of the fan, and out of any areas the duct leaks into when the fan isn't running.

Humidity

Low humidity can cause dehydration of lungs and nasal passages resulting in much higher susceptibility to respiratory infections; inadequate consumption of fluids or high altitude can increase this effect. Low humidity greatly increases the life of the smallpox virus. High humidity may increase the growth of molds, fungus, and other organisms.

Control your breathing

The time to inhale is immediately before you open a letter, not after. That way you won't inhale suddenly because you were startled by a cloud of powder and you will have enough air in your lungs to yell the word "evacuate" as you run for the exit or the shower holding your breath as long as you can. You will still need antibiotic treatment but your exposure will be minimized.

Conveyer Belts

You might be tempted to connect different compartments of your mailroom using conveyer belts. Think twice before doing this. A conveyer belt can continuously carry contaminants from one section to another and precautions will be needed to protect against this. The airflow direction in the duct through which the conveyer travels must be from low-contamination to high-contamination.

HVAC (Heating, Ventilation, and Air Conditioning)

For residences or small office buildings, the existing central air can be retrofitted with a HEPA filter or electrostatic precipitator. This will help but will not prevent biological agents from entering the premises.

In large buildings, the main air filters on the outside air intake should be replaced with a HEPA filter if the system can handle it. The system should be designed, if possible, to create positive pressure within the building so air flows out at doors, windows, and other leaks instead of biological agents flowing inward.

For all HVAC systems, the filter should be changed regularly and the AC coils cleaned. If the filter is clogged, air will find a way around the filter. Bacteria can actually breed inside the HVAC system, particularly on dirty filters and coils.

A properly designed germicidal UV light downstream of the coils could help kill anthrax and other biological agents. The intensity of the light must be sufficient to destroy the spores in the short time it takes them to pass by it. The light should preferably come from all directions so that spores riding on the side of dust particles are exposed. Germicidal UV lights, operated intermittently (and possibly moving through the ducts) could also be used to kill pathogens in HVAC ducts but care is needed to prevent people from being exposed to UV light through registers.

Air Exchange Rates

- Human Breathing: 0.5 CFM
- Typical house Outside Air Exchange Rate: [0.7 to 1 ACH](#)
- Tight house: 0.02 ACH
- Leaky house: 2 ACH
- Furnace Blower sizes:
: 600-2200CFM
1/4 horsepower: 1460 CFM
- Typical HEPA room air cleaner filter:
Honeywell 10500: 100CFM (9'x12' room 6 ACH)
Honeywell 11520: 150CFM (12'x14' room 6 ACH)
Honeywell 12520: 250CFM (16'x20' room 6 ACH)
Honeywell 13520: 350CFM (17'x22' room 6 ACH)
Honeywell 64500: 400CFM (22'x23' room 6 ACH)
- Ceiling mount HEPA/CPZ:
Honeywell F111C: 1000CFM (\$2200)
- Drop Ceiling electrostatic Precipitator:
Honeywell F57A (2'x4'): 875CFM (\$1237)
Honeywell F57B (2'x2'): 450CFM
- Furnace Mounted Electrostatic precipitator: (depends on furnace blower speed)
Honeywell F58F1000: up to 2000CFM \$475.
- Furnace Mounted HEPA filters: Trion Air Bear HE1400: up to 1400 CFM
Trion Air Bear HE2200: up to 2000 CFM \$560 (generic replacement HEPA filters \$25).
- Power-Vac truck system: 16000 CFM (used for cleaning household ducts).

- Large Airliner:
[15-30 ACH \(Boeing 727\)](#)
[20-30 ACH \(Boeing 767\)](#)

A person adds [0.25 pounds of water to the air per hour](#) (breathing and perspiration).

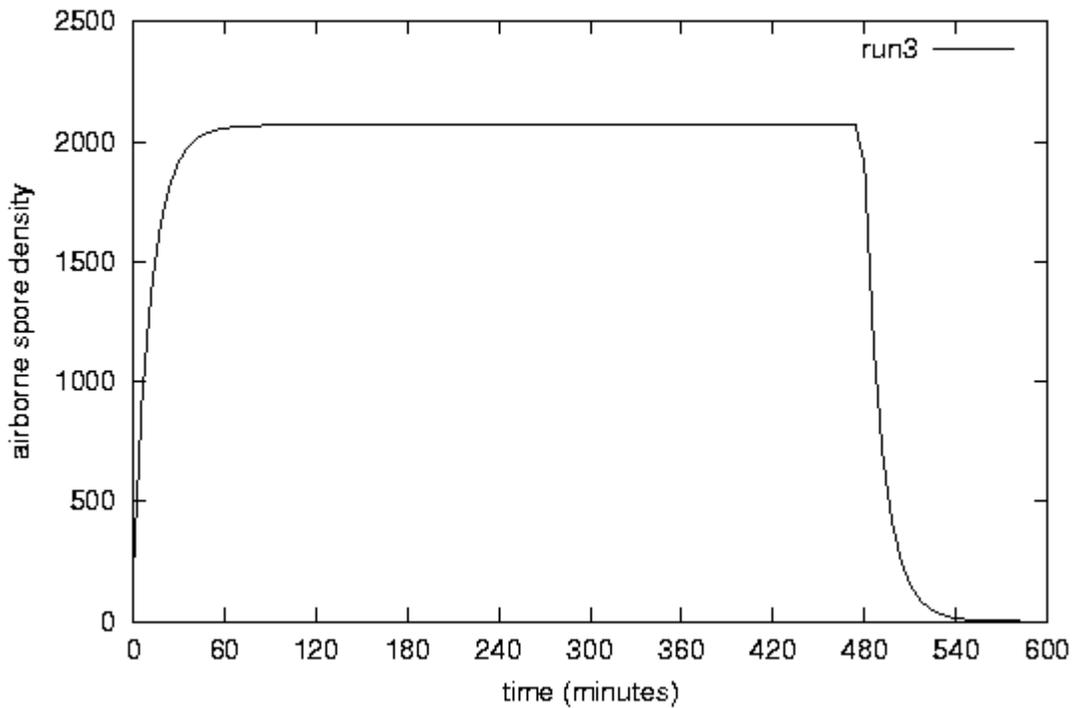
counterflow Air to Air Heat Exchangers

These devices are used for the controlled introduction of outside air without losing or gaining too much heat. Cost is around \$800. They transfer heat between the exhaust air and the intake air, and can reduce the energy loss by upto 80%. Condensation is likely in these heat exchangers and they should have a drain and some means for preventing microbial growth and for cleaning. Regular cleaning and disinfection is necessary to prevent breeding of legionnaires disease, anthrax, or other pathogens.



The following graph shows the results of a computer simulation by the author of an attack on a big box store such as Wal*Mart. Occupants of the store would receive a lethal dose of anthrax in an average of 8 minutes. At the conclusion of the run, most of the spores would have been exhausted to the outside. The release assumed one gallon of liquid agent with a 1% concentration of effective spores being released over eight hours. Spores which settle onto a surface are assumed to remain there permanently rather than becoming resuspended. 140 billion spores would have settled on various surfaces within the store; that means that there are 1 million spores per square foot or about one lethal dose per square inch.

```
rate_of_introduction_before_filter=          0 (particles/hour)
rate_of_introduction_after_filter=          4e+10 (particles/hour)
duration_of_introduction=          8 (particles/hour)
circulations_per_hour=          7
outside_air_mix_ratio=          0.2
leakage_air_changes_per_hour=          1
filter_efficiency=          0.25
settling_rate_meters_per_second=          0.003
volume_of_air_cubic_feet=          4e+06
ceiling_height=          32 (feet)
```



Bioterrorism and related incidents



The CDC has [an analysis with a nice table of selected bioterrorism incidents](#) prior to 1999. The information below is mostly derived from other sources.

Rajneshes

In 1984, a cult in Oregon spread salmonella bacteria via the salad bars at 10 restaurants and the fresh produce section of supermarkets. At least 750 people were infected. This was just a small test run for a larger plan to make residents of Wasco county so sick they couldn't participate in an election so cult members could take over the county government. It wasn't until a year later that it was known that this had been a manmade outbreak and then it did not receive much media coverage. Yes, this really happened. Read about it in the book "Germs" or various websites.

Aum Shinrikyo

After this cult used Sarin Nerve gas successfully in the Tokyo Subway, it was discovered that this cult, which wished to hasten armagedon, had made repeated attempts to use bioweapons. Fortunately, their attempts were inept.

Larry Wayne Harris

An racist, anti-semitic neo-Nazi microbiologist was arrested for ordering three vials of plague from the American Type Culture Collection. He claimed he needed it to develop a plague vaccine and/or for research for his book: [Bacteriological Warfare: A Major Threat to North America](#) . Some have described this a a how-to manual for bioterrorists. The condensed version I saw appeared to be mostly defensive, focusing primarily on the human use of veterinary antibiotics. It might be useful for a white-supremicist group which needed to protect itself from its own agression, and thus knew what agent was being used when, so that may have been the motivation. I would be very cautious about the accuracy of the information in his book. He was [arrested in 1998](#) for possetion of anthrax which **claimed**he had isolated from a pit where infected animals had been buried 40 years earlier. He claimed he was trying to develop a vaccine. The [charges were dropped](#) (but it still counted as a probation violation) when the anthrax tested to be a weak vacine strain. Harris is reported to have traveled the country offering immunizations to members of white-supremicist groups.

[An article](#) describes the activities of Larry Wayne Harris in more detail than most news reports.

2001 Anthrax in the mail

These attacks started on Sept 18th, one week after the WTC and pentagon attacks.

Here is a photo of the letter to Senator Daschle:



A Photo of the [Leahy Letter](#) is also available.

Fatalities			
Fatality #1	Diagnosed 2001-	Florida	Opened anthrax letter to Florida

skin anthrax	10-04 Died 2001-10-05		Tabloid
Fatality #2	Funeral 2001-10-21	Thomas L. Morris, Jr., Age 55 DC (Brentwood) Postal Worker	Daschle/Leahy letters?
Fatality #3 Inhalation Anthrax	Funeral 2001-10-22	Joseph Curseen DC (brentwood) Postal Worker	Daschle/Leahy letters?
Fatality #4	2001-10-31	Kathy Nguyen, Age 61 New York Hospital worker	Source Unknown
Fatality #5 Inhalation Anthrax	2001-11-19	94 year old Connecticut woman	Source unknown

Another summary of anthrax cases can be found in the OSD's [SITUATION REPORT: Anthrax](#).

Anthrax Letters				
Date	Addressee	Location	Affected	Fatalities
	American Media ("The Sun" Tabloid Publisher)	Boca Raton, Florida	Robert Stevens, 65, photo editor Ernesto Blanco, 75, mailroom emplyee 2 emplyees exposed	1 - Robert Stevens, 65, photo editor
Postmarked 2001-10-09, Trenton	Senator Leahy	DC	This letter was initially misrouted to a state department mail facility in sterling, VA when a machine misread the zipcode where a worker came down with inhalation anthrax. Was sealed in storage when mail was stopped and discovered much later as this mail was inspected.	2?
Postmarked 2001-10-09 Received 2001-10-15	Senator Tom Daschle	DC		0?
Postmarked 2001-09-18	Tom Brokaw (NBC Anchor)	New York City	Erin O'Conner, 38, assistant to brokaw,	

			cutaneous Mailroom Employee who opened letter Police officer exposed 2 lab techs exposed	
(letter not found)	ABC (Peter JenningS)		7 month old son of a producer, cutaneous	
2001-10-24?	Dan Rather (CBS)	New York	Assitant Claire Fletcher contracts skin anthrax.	
	NY Governor Pataki's office	Manhattan		
Contamination discovered 2001-10- 29	Supreme court/DOJ/Attorney General???	DC	Contamination discovered at offsite mail handling facility for US DOJ.	0
Contamination discovered in mail bin 2001-12-09. Some of the 600 pieces of mail being tested were postmarked in October. May be an anthrax letter or cross contamination.	Federal Reserve			



US Product Tampering incidents



Tylenol

Tylenol was poisoned with cyanide in 1982. After that, there were numerous copy-cat product tampering cases. There were 7 deaths in September/October 1989. The FDA investigated 270 incidents of suspected product tampering in the months that followed.

Chilean Grapes

This hoax occurred in 1989. The FDA detected two grapes which had been injected with cyanide after the US embassy received warnings that poisoned grapes were shipped to the US. Grapes from Chile were pulled from shelves and embargoed and tens of thousands of Chileans lost their jobs. Thing is, cyanide turns into a gas when exposed to the acid in grapes and dissipates (discoloring the surface of the grape in the process) so there is no way the grapes could have been poisoned in Chile. I, personally, traveled to Chile 2 weeks after this incident. Everybody

that heard I was going to chile said "Don't eat the grapes". Contrary to that advice, I ate lots of grapes which was not only good for my taste buds but also good for international relations.



World War II

The germans attacked draft animals in various countries destined to be used by allied troops using glanders and anthrax. Wheat blight may also have been used.

Asheville, Alabama

The water supply on a Black Muslim farm was allegedly poisoned with cyanide (the KKK is suspected) resulting in the death of 30 cows.

Information on agro-terrorism incidents can be found [here](#)

Berlin, Wisconson 1996

Animal feed was deliberately contaminated with chlordane by a competitor.

The Covenant, The Sword, and the Arm of the Lord (CSA)

In 1985, [33 gallons of cyanide were found](#) at this Right Wing Compound in Arkansas. The group had been discussing poisoning municiple water supplies.

The Weather Underground

In 1970, the [weather underground](#) (weathermen) allegedly tried to obtain biological agents by blackmailing a gay soldier at Ft. Detrick.

R.I.S.E.

In 1972, chigago college student Eco-terrorists plotted to wipe almost the entire human race using biological weapons but were unsuccessful in doing so.

Minnisota Patriots Council

[Convicted of conspiracy](#) to kill law enforcement officers with ricin toxin.

Gulf War Syndrome

This appears to be a non-event. It has been reported that gulf war veterans are healthier on average than non-veterans. I think I have seen what might be a credible report that the incidence of one particular disease was a little higher.

Indians and Smallpox

I have seen conflicting reports on whether the smallpox infected blankets were given to the American Indians maliciously or not. The results were certainly devastating.

Hawaiians and Gonorrhea

This was neither terrorism nor was it intentional; Captain Cook ordered his men not to sleep with the natives. Gonorrhea wiped out 80% of the Hawaiian population. The Hawaiians killed Captain Cook in retaliation. I, personally, have gone snorkelling where he was killed.

Jonestown

In 1978, a US congressman investigating the American doomsday cult, [The Peoples Temple](#) (followers of the Reverend Jim Jones), which had relocated to Jonestown, Guyana to escape government scrutiny, and 4 others were murdered (and 11 injured) by cult security guards after 16 temple members decided to leave with the visitors. 638 adults and 276 children in the cult died; many committed suicide by drinking cyanide laced Kool Aid (actually grape Flavor-Aid) in a mass suicide while others were apparently murdered. A small number escaped.

1918 Influenza Pandemic

[The 1918 Influenza Pandemic](#) was the "most devastating epidemic in recorded history". It was presumably a naturally occurring event. 20-40 million people died worldwide including 675,000 Americans. In 9 months, it spread around the world. 28% of all Americans were infected and a fifth of the world's population. The mortality rate was 2.5%. Apparently high humidity was linked to more severe epidemics.

The disease was named "Spanish Flu" because it affected large numbers of people there (8 million supposedly killed) early in the pandemic. The movements of large numbers of troops, and a medical system already overtaxed by the war, probably contributed to the spread of the disease. Then people moved by ship. Now, they move by airplane.

The fragments of the virus have been extracted from tissue samples and the DNA is being mapped.

See the [CDD Pandemic Influenza](#) page for information on other flu pandemics.



Potential Sources of Attack



Foreign

Hostile governments and

Domestic

I have seen the enemy ... and it is us - Pogo

According to a [Scientific American article](#), more victims are harmed by Racist groups, homophobes, anti-semites, and anti-abortion groups, individually, than all the classical terrorist attacks. Most of those are small hate-crime incidents; some of these groups, however, have turned to larger acts of terrorism including bombings, arson, and bioweapons.

- Right Wing organizations. Super Patriots. Militia.
Some of these organizations may just have legitimate concerns about (potential) abuses of government powers but the goal of many, such as the Christian Patriot movements, seems to be to violate the rights of others.

A document sold by the United Sovereigns, Militia Operation Plan American Viper, details the role of militias in a prolonged guerrilla war against the US government. Militias should engage in active high-level guerrilla operations to eliminate defended targets, larger troop concentrations and key leaders. Targets are to be eliminated by sniper tactics, explosives, ambushes, or chemical and [biological agents](#).

- Hate Groups
racists, homophobes, anti-semites, etc.
- Cults
Aum Shinrinko used biological weapons and nerve gas in Japan. The Rajneeshes used salmonella.
- Anti-abortion groups.
Some of these groups have been bombing abortion clinics and making fake anthrax attacks on abortion clinics for many years.
- Puerto Rican Separatists.
Puerto Rico has been part of the US for over 100 years. And the vast majority of Puerto Ricans seem to be comfortable with that. Only 2.5% of the population favors severing ties with the US. But there is a small violent minority. The majority of terrorist incidents in the US occur in Puerto Rico.
- Eco-terrorists

Most environmental groups are peaceful but there are eco-terrorist organizations such as Earth First and the Earth Liberation Front (ELF). ELF set fire to seven structures on Vail

Mountain, causing \$12 million dollars worth of property damage, to protest plans to develop some property which was supposedly in the habitat of the endangered Canada Lynx (which visits the area so rarely that there have been 65 reliable sightings in 120 years in the entire state). Earth-first has a long history of sabotage, including spiking trees (which causes serious injuries to lumber mill workers) and poring sugar into the gas tanks of bulldozers. ELF set fire to research labs.

As someone who cared about the environment before it was fashionable to do so, I am disturbed by the actions of many environmental groups these days. These groups have become far more political and far less environmental. I remember when Earth First threatened to destroy an astronomical observatory to be built on Mt Graham, the habitat of an endangered squirrel; now, if you want to protect an area, encouraging someone to build an observatory there can be a good idea - observatories like to negotiate a buffer zone around them that can't be developed. Even some of the peaceful groups have caused considerable economic harm in support of bogus causes. I was quite pissed when I heard that the boycott of swordfish was based on the idea that sustainable fishing would strike a cord with the public (and lead to donations) even though the American swordfish market is supplied from sustainable fishing and fish-farming. The move to ban motor vehicles on Cumberland Island was ostensibly to protect the sea turtle but was really to promote the interests of the rich families (who are exempt from the vehicle ban) which live there in having a private retreat on government land.

And the greatest arrogance of all: save the planet.

[...]

The planet has been through a lot worse than us. Been through all kinds of things worse than us. Been through earthquakes, volcanoes, plate tectonics, continental drift, solar flares, sun spots, magnetic storms, the magnetic reversal of the poles...hundreds of thousands of years of bombardment by comets and asteroids and meteors, worldwide floods, tidal waves, worldwide fires, erosion, cosmic rays, recurring ice ages...And we think some plastic bags, and some aluminum cans are going to make a difference? The planet...the planet...the planet isn't going anywhere. WE ARE!

- George Carlin: Jammin' In New York

But apparently some environmental groups would like to hasten our departure:

Isn't the only hope for the planet that the industrialized civilizations collapse? Isn't it our responsibility to bring that about?

- Maurice Strong, Head of the 1992 Earth Summit

- Animal Rights Fanatics

Attack people wearing fur, damage laboratories, indiscriminately release animals (which may have contagious diseases or not be prepared for life in the wild) from laboratories, vandalize laboratories ([including those doing research to protect endangered species](#)) and attack restaurants. [ALF is allegedly responsible](#) for the arson of a McDonalds in Tucson

and burning down a primate laboratory in Alamogordo, NM; both of these terrorist acts occurred after the Sept 11th attacks. Not only has animal research (which is usually painless for the animals) saved millions of human lives, it has also saved the lives of millions of animals (by discovering treatments for anthrax, rabies, and hundreds of other diseases) and reduced suffering of far more humans and animals.

I do not believe that a human being has a right to life; I would rather see experiments done on our children than on animals"?
- PeTA official

- Economically Motivated
News organizations, providers of survival goods, providers of disinfectants, military surplus stores, pharmaceutical and herbal manufacturers, biological labs, law enforcement, and many others potentially benefit economically from a public worried about terrorist attacks.
- Disenfranchised minorities
- School kids

Overall violence in schools is reportedly down but there is an increase in spectacular multiple shootings. Already, one teen has copycated the Sept 11th attacks (Cesna crash in Tampa); it would not be surprising if chemical and biological weapons were used in a future school attack.

- [1999-04-20: Columbine Massacre](#) in Littleton, Colorado, US.
Guns and explosives. 15 fatalities
If they could not escape the country after the shooting, they planned to "[hijack a plane and crash it into New York City](#)". City"
- 2001-11-24: New Bedford High School Massacre (Averted)
- 1998-03: [Thurston High, Springfield, Oregon, US](#). (BR) 3 fatalities, 23 injuries (there were conflicting reports on one victim).
- 1996-03-13: [Dunblane \(UK\)](#)
17 victims.
- 2001-03-05: [Santana High School, Santee \(San Diego\), CA, US](#).
2 fatalities, 15 injured (13 were shot, 1 hit by bullet fragment, 1 had heart attack).
- 2001-12-06: Fort Gibson, OK, US
4 students wounded
- 2001-03-24: Westside Middle School, Jonesboro, Arkansas, US.
5 killed, 10 wounded.
- 1997-10-1: Pearl, Mississippi, US
2 killed, 7 wounded.
- 1997-12-01: West Paducah, KY, US
3 killed, 5 wounded
- 1997-02-02: Moses Lake, Washington, US
- 2000-03-13: A thwarted conspiracy of four middle school kids to force their principal at gunpoint to call a school assembly so they could massacre everyone in attendance.

- 2000-05-20: Heritage High School, Conyers, Georgia, US
6 injured.
- 2001-02-05: Planned attack in Hoyt, Kansas, US,

More events are listed at [Infoplease: A Time Line of Recent School Shootings](#) and [Open Directory Project:Society:Issues:Violence:School:Incidents](#).

These attacks are not caused by things like listening to Nine Inch Nails or Marilyn Manson. Note that many of these incidents may have been caused by persecution of oddballs. Many teenagers have perfectly healthy interests in guns and explosives but when mental unbalance and factors such as the persecution of their ignorant xenophobic peers drives them to suicidal desparation, some use these technologies to take their percieved oppressors out with them. These teenagers are usually boys but at least 2 girls have been arrested. Lots of kids are picked on, only some of them go postal; wether that iw the luck of the draw, a matter of severity, or due to a weekness in these kids psyche, I don't know. But a witchhunt for potential gunmen could not only violate peoples civil rights but could further amplify feelings of alienation to the breaking point.

In fact, the extent to which they were dehumanized was a good measure of the likelihood that they would do the same to others.

- Disgruntled (former) employees
I remember going to work at IBM one day to find concrete guardrails in front of the front door. Seems an IBM employee at another location and had driven a vehicle through the front door and started shooting. And before they were known for delivering Anthrax, postal employees were known for going "Postal".



Countries/Organizations with Bioterrorism

Capabilities

The following countries are [believed to have biological weapons](#) Bulgaria, China, Cuba, Egypt, India, Iran, Iraq, Israel, Laos, Libya, North Korea, Pakistan, Romania, Russia, Serbia, South Africa, south Korea, Syria, Taiwan, Vietnam, and the United States.

Former Soviet Union

The soviet union had an enormous bioweapons program, in violation of the treaty which banned them, which made enough anthrax to kill everyone on the planet, among other pathogens. There are a huge number of former soviet bioweapons scientists who are unemployed or impoverished;

other countries and terrorist organizations have been trying to hire these people. The soviet union still appears to have a smaller bioweapons program, since they have refused inspections of a number of former biowarfare facilities. There are an estimated 7000 soviets who have the expertise to make biological weapons who could be hired away by terrorist organizations. The US has done a lot to keep soviet nuclear scientists gainfully employed and dismantle the nuclear program but relatively little to keep the former soviet biowarfare scientists employed.

Iraq

Iraq [admitted](#) it had produced at least 19,000 liters of BT, 8500 liters, of anthrax, 2200 liters of alfatoxin, and 340 liters of perfringens. All of those are concentrated amounts and more than half of each had been loaded into weapons. Iraq falsely claimed to have destroyed these stockpiles. To put things in perspective, 1 milliliter of the concentrated anthrax contained about a billion spores.

Iran

Iran has been aggressively trying to hire former soviet biowarfare scientists. From what I have personally heard, they have succeeded.

South Africa

The apartheid regime had a significant bioweapons program. Anthrax, botulinm toxin, Ebola, Marburg, and HIV. Apartheid apparently used biological agents to kill many opponents.

North Korea

North Korea has biological weapons. They may not be inclined to use them, however, since they themselves are probably more susceptible to biological weapons than their foes since medical care in North Korea is inadequate to cope with even naturally occurring disease.

Al Qaeda

Is believed to have bioweapons, sarin nerve gas, had plans to make ricin nerve gas, may have dirty bomb.

Libya

Tried to Hire South African Bioweapons scientests.

India

India is thought to have a "defensive bioweapons program".

Pakistan

May have a small bioweapons program.

United States

US Programs since the treaty banning biological weapons are believed to be purely defensive.

Anthrax Islands

- [Gruinard Island \(Britain's 'Anthrax Island'\)](#)
This island was quarantined for 48 years (enforced by patrolling warships) until someone forced the British government to disinfect the entire 520-acre island using 280 tons of formaldehyde.
 - [Vozrozhdehyle Island \(Renaissance Island\) \(Russia\)](#)
Hundreds of tons of anthrax were hastily bleached and buried here on this island which will soon be reconnected to the mainland as the Aral Sea recedes. Some anthrax survived the bleaching.
 - Plum Island was referred to as "Anthrax Island" in the movie [Silence of the Lambs](#). Yes, the US Department of Agriculture keeps anthrax spores used for its veterinary research at a facility on Plum Island located at the tip of Long Island rather than experiment with them on the mainland where there would be a greater risk of spread. Unlike the other two islands, there is not, as far as I know, massive contamination.
-

What form will future attacks take?

I don't go into a lot of detail here to avoid giving ideas to terrorists who haven't already thought of them.

Biological

- bulk mailing
- Aerosol release at events such as sports, concerts, parades, speeches, etc.
- Attack on airports, airplanes, or train station
- Attack on restaurant salad bars or produce in supermarket or field
- Aerosol release into air intake of large buildings
- Blight attack on US wheat/corn crops.
- Aerosol release upwind of a major city from a small airplane or boat.
- Biological agent dumped in water tower

- Product tampering
- Food poisoning
report tampering of FDA 24hr hotline +1-301-443-1240 unless it contains meat or poultry, in which case call the USDA at 1-800-535-4555.

Nerve Gas and other Chemical Attacks

Radiological Weapons

Nuclear material does not need to take part in a nuclear explosion to be deadly; its chemical and radiological properties can be as deadly as the sudden release of energy from a nuclear explosion. Plutonium is the most toxic substance known to man. The so-called dirty-bomb contains nuclear material which is disbursed by conventional explosives. Nuclear material can be spread by other means such as a crop duster.

Computer Terrorism

Conventional Bombs

Fuel/Air explosives

Hijackings

Current airport security is sadly lacking. It provides substantial delays and inconvenience to legitimate passengers but doesn't prevent terrorists from taking weapons onto planes.



Precautions against other forms of attack



Safe Rooms

I have seen a news report advocating that you create a "safe room", in a room with no windows such as a bathroom, with emergency supplies. This is a good idea, however the report I saw was quite inadequate. The room needs to be totally sealed from the outside, yet you need to be able to breath. In practice, this means you must have a HEPA filtered air inlet, preferably with a fan and battery backup. Sealed also means that you duct tape not only around doors and exhausts but also over electrical outlets. Also, there needs to be a place for air to be exhausted which should preferably be HEPA filtered as well to protect against backdrafts or power failures. In a typical bathroom, you might be able to duct tape a HEPA filter over the exhaust fan and another over the central air conditioning duct to provide a filtered air exhaust and inlet. Unfortunately, running the central air will increase the number of pathogens which infect the central air ducts. Running the exhaust fan in the normal direction will cause a negative pressure in the bathroom which makes

it easier for pathogens to enter via any leaks you may have left. Be sure to tape around where the water/sewage pipes enter and exit the bathroom, over cracks in the walls, and all around the baseboard (the baseboard typically covers, poorly, giant gaps between the wallboard and the floor). If you are using candles or a propane stove or heater, you will need adequate ventilation.

Many of the emergency precautions related to a safe room will also help protect you against storms, natural disasters, acts of war and terrorism.

In planning a safe room, you should consider two scenarios. In the simpler scenario, an infectious agent is released into the air but water, electricity, natural gas, sewage, telephone, and internet continue to function. In the more severe scenario, one or more utilities cease to function either because of a simultaneous synergistic attack or because the humans who maintain that utilities are incapacitated. If your resources are limited, you may only be able to provide for the first scenario or for brief duration outages.

You should have the following items ready:

- Duct Tape
- Clean air
HEPA filtered air inlets and outlets are recommended.
- Drinking water
Bottled water
- Food
You should have a supply of foods and the means to prepare it if heating is necessary. MREs are good for a brief stay. A propane stove if you want the food hot.
- Light
Emergency lights, Flashlights, candles, etc.
- Communications
Radio/TV (battery powered). Landline phone. Cell Phone. Laptop computer or net appliance for internet access.
- Elimination
If you are using the bathroom, you have a way to dispose of human waste, as long as the water main still has water. You may want a port-a-potty of some sort.
- Shaving
In the event of an airborne attack, those with facial hair will probably want to shave their facial hair to permit face masks to seal properly.
- Birth Control/Safe Sex supplies
If you are going to be locked in a small room with a member of the appropriate sex, there aren't any children around, with nothing to do for entertainment and facing a possible doomsday scenario, there are certain activities which are likely to transpire for which you should be prepared lest you face unintended consequences should you survive. 9 months after the great blackout on the east coast of the united states, maternity wards were overwhelmed with deliveries.
- Heating/Cooling
- Vitamins
You may want an adequate supply of vitamin C, garlic, and other immune system

boosters. Your diet is likely to leave something to be desired while you are holed up at a time when your immune system needs to be at its peak.

- First Aid kit

- Medicines

Any medicines you need regularly should be stored in the safe room or you should rehearse taking your medicine with you into the room.

- Weapons

Note that if you need to use these, you can pretty much forget about maintaining clean air in the safe room. But some of those who did not plan ahead will be out to steal from those who did.

- Spare Batteries

In the event of an airborne release that requires you to use the safe room, the entire rest of your house, including the HVAC ducts, is likely to be contaminated when you emerge from the safe room. So, you will need to relocate or decontaminate and/or be vaccinated and take antibiotics.

FEMA has information on building a [Tornado Safe Room](#)

I would recommend three HEPA filters to protect a safe room.

- retrofit the central HVAC with a HEPA filter or electrostatic precipitator (requires duct modifications). If you can't do that, at least make sure you have recently replaced your regular filter. Use the type of regular filter that has a permanent electrostatic charge; these do a better job when new (once a little crud builds up, the electrostatic charge is less effective but the stickyness of the crud makes up for it). Set the thermostat to FAN always on when you go to the safe room and close HVAC vents in other rooms if you can.
- Duct tape one HEPA filter over the bathroom HVAC Duct or better yet, an more permanent assembly with a HEPA filter and a fan downstream of it. Check to make sure this fan doesn't create a negative pressure.
- Duct tape one HEPA filter over the bathroom exhaust fan Do not run the exhaust fan.
- Duct tape around doors, windows (if any), baseboards, and any other cracks

The airflow order here is:

- Outside Air
- House (negative pressure)
- HVAC intake manifold (negative pressure)
- HEPA filter
- HVAC Fan
- Heating/AC Duct to bathroom (slight positive pressure)
- HEPA Filter
- Small Fan (optional)
- Safe Room (slight positive pressure)
- HEPA Filter
- Exhaust fan (OFF!)

- Exhaust fan duct (slight positive pressure)
- Outside

One of the biggest limitations of such a saferoom is that you will need to go into the saferoom before the aerosol release reaches you but biological weapons tend not to provide a warning. Having a safe room does provide protection if you have reason to believe an attack is immediately imminent or you if you receive an early warning via the emergency broadcast system of a release in a city upwind of you. Or if there is a bomb explosion and you suspect there might be a biological release associated with it. And it does help keep you from being in that gut wrenching situation where you know you need to seek shelter but none is available.

If you want to create a saferoom outside the house, an [intermodal container](#) (preferably an insulated one) can be a good starting point. These containers are sturdy and watertight (which means they may be close to airtight from the start). These containers are typically made of aluminum or steel and welded around all the edges which greatly resists leaks. Duct tape around the edges of the door would still be a good idea to help make them air tight. Provision should be made for HEPA filtered ventilation. Intermodal containers are those metal containers which are designed for use on ships, trains, and trucks (hence the name). They are typically 8'x20' or 8'x40' but there are many other sizes. You may also see them used as temporary storage sheds behind large retail stores, at construction sites, and in other places. Container ships push containers overboard in extremely rough seas to reduce the possibility of capsizing. The containers can float and pose a collision hazard to smaller boats.

Have you done safe room drills?

Car protection

One could try to maintain a HEPA filtered positive pressure environment in a car but it would be difficult. Self induced 55 mile winds would pose a considerable challenge. Newer cars are likely to seal better than older ones. Protecting the seems to makes sense at first because it would provide a safe means of evacuation which would put you further from the source. In the event of a known biological attack with a contagious agent, however, the national guard is likely to be instructed to block all roads out of the infected area to maintain quarantine. For temporary protection while you are in your car, the easiest solution is to keep some respirators in the car.

Water Supply

A biological attack on the water supply, downstream from the purification process, is possible. The chlorine which is added to the water would reduce the effectiveness of most biological weapons. Bottled water is one of the simpler ways to provide at least a short term drinking water supply, either in single serving sizes or 5 gallon water cooler bottles. Sophisticated water filtration and storage systems are also possible.

Food Supply

The food supply is quite vulnerable to biological weapons. A BW could be used to infect people via food. More than 750 people were deliberately infected in Oregon via food. Some biological weapons are designed to ruin food crops or food stores and render them unusable to create a food shortage. 19 plants account for something like 80% of the American Diet. Therefore, you should have a stockpile of safe food available.

In the event of an imminent attack on the food supply with an agent that is infectious to humans, avoid the salad bar and buffet. Avoid pump dispensers for ketchup and other condiments, which are easily poisoned. Not only are these among the easiest places to deliberately spread infectious substances, they also lend themselves to person to person transmission via utensils. Even when there is not an attack expected, you may want to get in the habit of washing your hands with something like Purell (a no-rinse disinfectant) before and after each trip to the buffet/salad bar. Fresh produce is also particularly vulnerable to infection in the supermarket, in the field, or in between. In the event of a suspected attack, use all fresh produce in well cooked dishes such as soup if you consume it at all. Note that avoiding fresh produce for a long period of time could be detrimental to your health and might even make you more vulnerable to biological weapons, so don't overdo this. Foods prepared in a pressure cooker will be safer than those which are merely boiled.

One of the easiest ways to ensure you have food available is to have a surplus of canned food on hand in dated cans and rotate the stock properly so that you have a supply of food which is at least 1-2 months old (so you would have heard if it was contaminated) and preferably less than a year old.

- meats: canned tunafish, canned chicken, canned ham, canned corned beef, spam, beef jerky, bouillon, summer sausage, pepperoni.
- Vegetables: canned green beans, canned veg-all, canned yams, canned spinach, etc. Dehydrated vegetables. Canned or bottled vegetable juices (V8). Canned tomatoes. Canned mushrooms. Canned beets. Pickles. Salsa. Spirulina Algae, powdered wheatgrass, barley green powder.
- legumes: kidney beans, chick peas, refried beans, pork&beans, TVP.
- Dairy: extended shelf life milk, non-fat dried milk, canned evaporated milk, powdered cheese, Cheese packed in wax. Ensure or Slim Fast meal replacement shakes.
- Fruits: canned tropical fruit (check vitamin C content), dehydrated apples, raisins, dried cranberries, prunes, dried apricots, canned mandarin oranges. Canned or bottled fruit juices.
- Grains: flax seed, canned corn, crackers or similar unleavened bread, raisin bran cereal, rice, oats, wheat berries (if you have a grain mill), whole wheat flour (needs to be rotated frequently), pasta, popcorn. Note that moths love just about everything in this category and if it is not stored in well sealed containers, they will get it. Bread will not be available in an emergency (it is too perishable) so plan on alternatives.
- Root vegetables: whole sweet potatoes, potatoes, onions, and garlic if you have a root cellar or other way to store them for long periods of time. Dehydrated mashed potatoes or potato soup mix. Dehydrated onions. Dehydrated minced garlic or garlic powder.
- Prepared foods: canned soup, canned chili, spaghetti sauce, picnic, power bars, ramen noodles, etc.

- Enzymes: Do you need beano, lactaid, or similar enzymes to help you digest food?
- Nuts: canned mixed nuts, canned peanuts, canned cashews, canned almonds. Peanut butter, Cashew butter, or Tahini (sesame seed paste).
- Fats and Oils.
- Vitamins. Vitamin C is particularly important not only because it is important to the immune system, which can make the difference between living and dying in a biological attack, but because emergency diets could even cause scurvy. Vitamin C is destroyed by cooking and canning and comes primarily from fresh produce.
- Drink Mixes: tang (Vitamin C), Slim Fast with Soy Protein or similar just add water meal replacement, Tea/Cocoa/Cider/Coffee (for comfort, particularly in cold conditions or low humidity.).
- (optional) Herbs and spices, condiments
- (Optional) Cultures: bread yeast, live brewers yeast, yogurt starter, kefir grains, kombucha, etc. Note that producing fermented foods after a biological attack could require a HEPA filtered work area and other laboratory type precautions.
- Utensils: Grain mill. Cups, plates, bowls, and silverware. Dish washing detergent and sponge. Cooking pots and/or pressure cooker. Propane or gasoline stove and fuel supply.

Military MREs (Meals Ready to Eat - the new version of the old C-rations) provide a handy source of short term emergency food. Buy new MREs and consume the old when you go camping or on long car trips. A case of 12 meals costs around \$60 at the local military surplus store.

Survival rations are the best bet for long term (3 months - 1 year) emergency food supplies. These are typically gallon cans filled with dehydrated food and an oxygen absorber. These can have a shelf life of [5 years or so](#), depending on the type of food, its moisture content, exactly how it was packed, and the storage temperature.

Consider Seeds for planting new crops. Seeds from local seed exchanges are likely to be less vulnerable to crop killing biological weapons than corporate monoculture seeds.

Airline Travel

- For your own protection and the protection of others, if you are travelling internationally, make sure your vaccinations are up to date for the region you are travelling to.
- Check your baggage and pockets before your flight for any weapons you may have left there and forgotten or which might have been put there by someone else.
- Arrive at least 2 hours before your flight to allow for security checks.
- Drink lots of fluids on the flight. The 7000ft effective altitude and low humidity (5-35%, typically 15-20%) in the airplane cabin can cause dehydration of the lungs and nasal passages greatly increasing your susceptibility to airborne illnesses including any BW agents released onboard the plane or in the airport before you boarded and any contagious diseases of the passengers seated on either side of you.
- Rare situations where you are kept in the plane with the ventilation system not operating have the potential to spread disease. Normally, you are breathing recirculated HEPA filtered air mixed with a very high outside air exchange rate except for a few minutes

during take off and landing. The [airflow design](#) is such that you are sharing air with the passengers immediately on either side of you but not much with the rows in front or behind.

- An N95 or better mask (without valve for exhalation) will help protect you onboard an airplane in several ways: 1) it will filter out at least some of any BW agent, 2) it will retain moisture, protecting you from dehydration of your respiratory tract, 3) it will retain carbon dioxide which will make you breathe harder increasing your blood oxygen content and reducing your water loss through urine. Unfortunately, it may also fog up glasses no matter how much you mess with the
- Keep an eye on security. If security is lax, call the FAA.
- The seats just behind the wing have the greatest chance of survival in an accident.
- Keep an eye out for suspicious behavior.
- Pay attention to the flight attendants safety briefing.
- Program suitable emergency numbers into your cell phone speed dial and/or carry them with you. Don't use your cell phone in flight unless there is a hijacking. Some possible numbers to call: FAA (24hr Safety hotline 800-255-1111), FBI (+1-866-483-5137), the air traffic control center at your destination or departure airport, the white house, FEMA, or even the number of the airline you are traveling on. 911 will probably get you a local dispatcher in the area below you who can make the contacts on your behalf. If you did not do your homework, you will probably at least find the airlines number on your ticket. Give your name (so they can check it against passenger logs to help confirm that it is not a hoax), the fact that you are on a hijacked plane, your airline and flight number. Set your phone on vibrate so they can call back.
- Bolster your immune system. Take lots of vitamin C before and after flying. Eat healthy meals before and after flying.
- In the event of a known BW agent release, your best bet for safe air is probably the emergency oxygen masks - ask a flight attendant to have the pilot deploy them. I think, but am not sure, that these use outside air. You will probably have still been exposed by that point but you will be treated with antibiotics, vaccines, etc. when the plane lands. Note: the pathogen may be able to enter the body through the eyes so you may want to protect them by, at the very least, keeping them closed.
- In the event of a terrorist hijacking or attempting to blow up your flight, don't be a coward. You have nothing to lose and everything to gain. If you have been hijacked, you will die due to one of three conditions unless you act: 1) the terrorist will crash the plane (probably causing many deaths on the ground too), 2) the terrorist will blow up the plane, or 3) the US air force will shoot the plane down to prevent more casualties on the ground. Act as a group, rather than individually. The shoe-icide bomber (Richard Reed) was incapacitated by passengers before he could blow up the airplane. Everyone survived. The 4th plane on september 11th which crashed in a rural area of Pennsylvania probably did so because of the heroics of someone on board. Yes, everyone on the plane died (which was a foregone conclusion either way) but no one else on the ground died because of such heroics. Use improvised weapons. If you hit someone in the back of a head with a full 12oz soda can end on, it will injure them. If you put some cans inside a handbag or a piece of cloth and swing them by the handle/cloth, it becomes a crude maul. Maybe you can use the headphone cord as a garrot. Silverware, a pen or pencil, a stick or similar objects may be used to stab or to concentrate force. If you hit someone in the skull hard

with the small end of a mini-maglite, it will concentrate the force and will probably crack the skull. Hot coffee thrown in the face will scald and may temporarily blind someone (don't worry much about splattering scalding water on other passengers other than the ones participating in a coordinated attack on the hijacker). Dump the rest of the hot water down their crotch. Poke them in the eyes. knee them in the groin. Knock them upside the head with a briefcase or laptop computer. Trip them or grab their feet.

- Read the [FAA Security Tips](#)



Sample Mail handling Configurations



Config 1

This is for an organization that processes enough mail that cumulative exposure could be a significant problem or which has a possibility of occasional direct attacks.

Direct mail delivery (not scanned and destroyed), double autoclaving, triple inspection. Located in a insulated intermodal container. No large parcel handling. Magnetic media duplicated. Biosafety cabinets vent through smokestack with a second HEPA filter. The smokestack is presumably positioned so it doesn't vent into your main buildings air intake. Smokestack may also bubble through disinfectant trap and have germicidal UV lights. Showers will be plumbed for hot water, cold water, and germicide. Showers drain into one of two large tanks (selectable). When one tank is sufficiently full, germicide is added and allowed to sit for 24 hours while the other tank is used. From one end of the container to the other:

- ventilated airlock for incoming mail
- Biosafety cabinet #1 vented through a second HEPA filter to outside
supplied air respiration, possibly full suit.
computer with DVD-ROM/floppy drives to read magnetic media before destruction,
ethernet connection.
Additional HEPA exhaust system to ensure negative pressure in this compartment.
- Partition with pass through autoclave and double door shower stall.
- Biosafety cabinet #2, vented through a second HEPA filter to outside
supplied air respiration
- Partition with pass through autoclave and double door shower stall.
- Biosafety cabinet #3 no respirator or surgical mask
- partition with pass through hole
shower.
- Mail sorting area (non-hazmat)
computer with DVD-R/CD-R/floppy drives to read magnetic media before destruction.
- Exterior door.
HEPA filtered air intake

Ideally, the autoclaves directly connect the protected areas of the three BSC cabinets. Mail trays in sealed bags are passed through the airlock from outside into the first area where they are transferred onto the first BSC before being cut open. Mail is loaded into the first pass-through autoclave. Once autoclaved, it is removed from the second autoclave and each letter is inspected and opened. The envelope and its contents are separated here. The contents are stapled or paperclipped together (this may leave a small rust stain) and placed in the second pass through autoclave. Items are removed from the second autoclave are checked for proper autoclaving (check test strips) at the third BSC and then passed to the mail sorting area. and sorted for internal delivery. This way, each letter is autoclaved twice and any mail spores which are transferred from the envelope to the letter are autoclaved again. Mail loaded into autoclaves should be separated, perhaps by the coils of a very large stainless steel spring.

The appeal of Bioweapons

On a large scale, bioweapons are weapons of mass destruction which have a destructive power equivalent to nuclear weapons. But they are much easier to produce than nuclear weapons, they can be produced clandestinely, and they can be produced on a small scale or a massive scale. The soviet union had a bioweapons program that was not detected by the US but posed as much of a threat as their nuclear program. Iraq had a huge bioweapons program that it was also able to hide to a degree from the US and even from UN weapons inspectors. Iraq was apparently willing to undergo embargo for years rather than dismantle its bioweapons program because its political clout in the region depends in large part on its ability to bully its neighbors.

Like nuclear weapons, however, use of biological weapons can come back to haunt the user, either due to retaliation or because the effects can spread outside the intended area. Also, the use of either type of weapon of mass destruction could make the territory uninhabitable and thus deprive the user of the spoils of war.

Antibiotics

Antibiotics can be very helpful in the treatment of biological weapon induced disease. Self-administration of antibiotics can be dangerous as well as illegal. People taking antibiotics may also need other medications, as well. Therefore, one should use antibiotics under the direction of a physician. Large numbers of people stockpiling antibiotics could create a shortage which means that people who need antibiotics for treatment of bioweapon induced or naturally occurring diseases might not be able to get them. The government has stockpiles which will be administered to those who need it. Some people will can have adverse reactions, including

potentially fatal anaphylactic shock, to antibiotics. Antibiotics can kill the natural bacteria in the digestive tract which makes a person prone to infection by hostile bacteria in the digestive tract; yogurt, kefir, or acidophilus and/or L. bifidus supplements can help restore the natural flora in the digestive tract. Improper use of antibiotics can lead to antibiotic resistant strains which pose a threat to the person who uses them improperly and other people; this is why you should always finish your antibiotic prescription, even after your symptoms go away, unless otherwise directed by a physician. People taking prophylactic doses of antibiotics to protect against bioterrorism could also breed antibiotic resistant strains.

Note that there are companies fraudulently selling antibiotics on the internet. If they are willing to sell you antibiotics without a prescription or prescribe antibiotics without a prescription, don't trust them. The antibiotics may not be what they say they are. You might get a foreign knockoff manufactured under lesser or non-existent safety standards. You might get expired medications. You might get a plain clay tablet, aspirin, cold remedies, or other inexpensive pills. You might even get maliciously adulterated medications.



There are companies selling herbal preparations such as oregano oil or zinc mineral water to treat anthrax. While some herbs are useful for some diseases or conditions, there are no herbs or combination of them which have been shown to be an effective cure against anthrax. Unless otherwise instructed by your doctor, taking foods, vitamin supplements and herbs which support the immune system may be a good thing but make sure they don't interfere with the function of the prescribed medications. I.E. citrus fruit, garlic, a multivitamin, vitamin C, vitamin E, and maybe echinacea. On the other hand, cranberries contain vitamin C and quinine but can cause some medications to be lost in the urine at a high rate.

If you believe that any homeopathic remedy is an effective treatment for any condition or disease, let alone a potentially fatal one, by all means take it and improve the gene pool by removing yourself from it.

Personal note: I think medical malpractice is the primary cause of disease resistant strains. Doctors blame the patients for not following instructions when, in fact, it is the instructions themselves that are lacking. I have been prescribed antibiotics by a dozen different doctors. I do not recall a single case where the doctor explained adequately that you must finish the entire prescription. Nor do I recall a single case where the doctor explained the negative effect of antibiotics on intestinal flora and the importance of consuming probiotics while on antibiotics. Instead, I have had difficulty getting doctors to prescribe a long enough course of antibiotics to kill the drugs.



Production Techniques



I will NOT be presenting recipes for the production of biological agents here but I will be discussing some of the techniques to better understand the threat and the terminology and so the reader will realize how much information is already in open documents. The government and media have often presented the weaponization of anthrax as requiring very sophisticated technologies when many of the technologies needed are now readily available and inexpensive as they are used by civilian industries. What required a lot of new technology in the 1950s when we actually had a bioweapons program can now be done with off the shelf equipment.

Project Bachus

In 1998, the US Defense Threat Reduction Agency gave a group of scientists \$1.6 million and told them to pose as civilians and make a small factory capable of mass producing biological weapons. Now bear in mind that a million dollars is equivalent to the funding for a very small laboratory and is well within the reach of cults and terrorists. The goal was to see if they could do it and see if they could identify equipment buying patterns or building emissions signatures that might help identify a malicious group doing the same thing. In about two years, they had a working system and produced a test run of two pounds of *Bacillus thuringiensis*, an anthrax simulant. The plant was then used to test commando raid techniques to attack and neutralized a plant without releasing the (simulated) deadly agent. The project used a 50 liter fermenter and rate of production capacity seems to be somewhere in the vicinity of a half pound of weapons grade anthrax (simulant) per week. The project did not arouse the suspicions of any law enforcement agency. This project was conducted in such a way as to not violate the bio-weapons treaty. Bachus is an made up acronym for Biotechnology Activity CHaracterization by Unconfentional Signals but is also the name of the greek god of fermentation. An [ABC News Article](#) has a picture.

Personally, my impression is that the 1.6 million dollar figure is very high. Maybe the scientists working on the project thought that fancy sports cars were needed to support their cover story of working for some high-tech startup company. Maybe they were using scaled down versions of what a safety-oriented mass producing US pharmaceutical company would use instead of technologies appropriate to scale. Maybe that dollar figure included all the monitoring equipment they were using to see if they could detect the process. Maybe there are some complex steps of the process that the cat hasn't let out of the bag yet.

Weapons grade

What constitutes weapon grade anthrax? It is produced from a strain of the disease that is particularly dangerous to humans. It is antibiotic resistant and/or aerosolized. In this case aerosolized means that it has been produced to the size which penetrates to the lungs and that the static charge typical of particles that size, which would make it stick to things before it got to the lungs, has been neutralized.

Some of the production steps and equipment needed for military biological weapons manufacture would not be necessary for terrorist use. Terrorists don't need elaborate safety and containment equipment since they often don't care who they kill. They do not need to produce a powdered form because they don't need to pack it into bombs which can be stored for indefinite periods of time. They could even manufacture the product at the site of its dissemination.

Fermenter

Used for fermenting bacteria and other agents in growth medium (such as beef stew). Similar equipment is used in breweries and dairies.

Incubator

Used to incubate petry dishes or eggs which are used to grow agent.

Spray Dryer

The purpose of spray drying is to get a very small particle sizes that will penetrate deep into the lungs. Spray drying Liquid agent is sprayed from a atomizing nozzle surrounded by another nozzle releasing high temperature gas. The particles are not completely dried by the hot gas so they never exceed the boiling temperature so many heat sensitive products survive the process. The equipment is widely available; spray dryers are used to produce such innocuous substances as yeast, non-fat dried milk, and paint.

The Iraqis apparently used a vacuum drum drying process that was highly efficient at massive scale production instead of a spray dryer.

For small quantities, a heat lamp can be used instead of a spray dryer.

Milling

Milling makes the spray dried particles even smaller. An article entitled [Milling Anthrax: Just a Click Away](#) refutes the notion that this technology is all that hard to come by.

Anti-caking

Anti-caking additives are used to prevent the spores from clumping together into larger, less effective, particles. The [Iraqis used Bentonite](#) .

Static Charge Neutralization

Chemical additives are used to neutralize the charge which causes the particles to stick to clump, stick to dust particles, the ground, HVAC ducts, and other surfaces before it reaches the lungs. It appears that they bentonite used by the Iraqis or silica will do this.

Separation

Some process is needed to separate the agent from the growth medium. This could include common laboratory techniques such as filters and centrifuges as well as chemical reactions to remove specific substances.

Silica

Silica was found in the anthrax delivered through the mail and was cited as evidence of its weaponization. Silica (silicon dioxide - aka. sand) is an anti-caking agent, an emulsifier, and silica gel is a desiccant (drying agent). So, silica could have been used for any of all of these three properties. Silica gel could also be used to keep the anthrax dry in storage so it won't revert from the spore form (as well as not clumping). Silica gel is also used when transporting anthrax infected tissue samples. Interestingly, silica gel is also used as an Adjuvant (A substance which is administered with an antigen to stimulate an immune response to the antigen) in vaccines.

Measurement Equipment

Microscopes, flow cytometers, temperature probes, and a variety of other laboratory equipment would be needed to monitor the process and the result.

Biological Safety Equipment

Biological Safety cabinets, ventilation/filtration systems, hazmat suits, autoclaves, disinfectants, refrigerators, etc. would be needed.

Bomb filling station

Soviet dual-use technology included a machine which could either fill milk bottles or bomblets. A terrorist organization making small quantities wouldn't even need such a fancy gadget.

Storage

Military programs need to stockpile the weapons for years so they must have the agent in a very stable form. Terrorists do not necessarily need to store it for very long.

Dissemination Equipment

Military use requires equipment more sophisticated than your average crop duster to distribute the material. Terrorists, however, don't necessarily need to use traditional high-tech military methods since they are willing to get much closer to their target.

< When this issue is raised, it is frequently pointed out that sophisticated technology is needed to disseminate the biological agent. Unfortunately, the technology to disperse fine aerosols from liquids or solids is readily available.

Sources of bioweapon cultures

- [American Type Culture Collection](#)
Located in Manassas, VA and/or Rockville, MD, this repository provides cultures of all types of organisms for legitimate researchers all over the world. The Rajneeshe cult and the Iraqis ordered germs from this repository. About 1996, tighter controls were placed on orders from here after Larry Wayne Harris was arrested for buying three vials of plague.
- The black market
Germs from the Soviet, Iraqi, and South African germ warfare programs are likely to have made it onto the black market.
- Antrax islands
- Places where the disease occurs naturally.
- From dead animals.
- Research labs. USAMRIID, CIA, DTRA, etc.
It is hard to get in but it is easier for someone working in those labs to take samples out. And it is impossible to account for every microbe.
- Food
- Genetic sequencing
Some of these biological agents are being or have been sequenced. This data will need to be available to researchers for it to be useful. Unfortunately, this also probably means that within a decade terrorists will be able to get ahold of untraceable CD-ROM or online copies of the gene sequencing data for many biological weapons and reconstruct the agents. While a biological laboratory will be needed for the reconstruction, no special equipment will be needed to make copies of the data.



There is an informative introduction to [Epidemiology For Engineers](#).



Now would be a good time to give gifts that improve emergency preparedness. Camping gear. HEPA filters. Emergency lights. Battery powered radios and TVs. Water purification. MREs or 30 day survival food rations. First aid kits. HEPA filtered vacuums. Respirators. Hand operated grain mills. Pressure cookers.



Popular Fiction, Non-fiction, and movies



The fictional accounts depict just how hard it can be to contain a deadly micro-organism and present scenarios that illustrate the kinds of complications which can occur and how hard it can be to prevent civil unrest, breach of quarantine, etc. Note that the US military is typically depicted as the bad guy in these fictional accounts. The US military, however, appears to have dismantled its offensive biowarfare program starting in 1969.

- Germs: Biological Weapons and America's Secret War [\[Amazon\]](#) by Judith Miller, Stephen Engelberg, William J. Broad
Published in September 2001, this book was written before the Sept 11th attacks and the anthrax in the mail attacks. Presents a history of biological weapons and the people in the US government who influenced policy. Concluded that bioweapons would be used by terrorists on US soil. A month after it was published, there was anthrax in the mail. A significant amount of information on the US, soviet, and Iraqi programs on this page comes from this book.
 - The Andromeda Strain. (Fiction) (Book) [\[Movie \(1971\)\]](#).
A deadly microorganism is brought back by a space probe. IMDB Rating: 7.0
 - Outbreak (Fiction) [\[Movie \(1995\)\]](#)
After an outbreak of the fictional Mutabo virus (based on Ebola Zaire but worse) in africa, the virus makes its way to the US. IMDB Rating: 6.4. Trivia: the biohazard suits were not real, they were made by [Global Effects](#). The biological precautions depicted in the movie, particularly the opening credits, look pretty consistent with published standards. There are many little technical errors but overall it is pretty good.
 - Warning Sign. (Fiction) [\(Movie \(1985\)\)](#)
An accident occurs at a biological weapons laboratory disguised as a agricultural research center causing the building to be sealed off. IMDB Rating: 5.5
 - [Biohazard \(Non-fiction\) \(Book\)](#)
Written by Ken Alibek, a top russian scientist in the russian Biopreparat program (The USSR had a biowarfare arsenal comparable to their nuclear arsenal after they had signed a treaty banning bio-warfare worldwide).
 - The hot-zone (Non-fiction) (Book)
The struggle to contain an outbreak of ebola virus in a laboratory in a suburb of DC. Sound like fiction? It actually happened.
 - The Cobra Event (Fiction) (Book)
The author of the Hot Zone writes a fictional scenario based on a genetically modified pathogen. This novel had a strong influence on President Clinton.
 - Rainbow Six (Fiction) by Tom Clancy
 - The Satan Bug (Movie) (1965)
-

Responding Agencies

- 911
911 dispatchers will alert local emergency personnel
- Local Police and Rescue Squad
- FBI
The FBI has primary jurisdiction once there is evidence of bioterrorism
- National Guard
Has bioterrorism response units and may be needed to conduct crowd control.
- Local Public Health Department
- FEMA - Federal Emergency Management Agency
- Redcross
The Redcross handles providing food, shelter, and clothing to victims of an attack.
- State Governor
- CDC - Centers for Disease Control
- USMRIID (Fort Detrick)
- EPA - Environmental Protection Agency
- NMRC - Naval Medical Research Center.
- Environmental Response Team www.ert.org
- FDA
- [Office of Homeland Security](#)
Federal anti-terrorism czar Tom Ridge
- USDA - US Department of Agriculture
Deals with anthrax infected animals
- OSHA - Occupational Safety and Health Administration
- NDPO - National Domestic Preparedness Office
- Los Alamos National Laboratory
Sample Analysis

State agencies (Virginia)

- [Virginia Department of Emergency Management](#)

Air Transportable Hospitals

The US military has a program to create [Chemically/Biologically Hardened Air Transportable Hospitals \(CHATHs\)](#) from the existing air-transportable hospitals. Not sure what the status is.



- [Anthrax MSDS](#)
- [Control of communicable diseases manual - anthrax](#)
- [CDC/NIH Biosafety in Microbiological and Biomedical Laboratories \(BMBL\).](#)
- [Clinical and Epidemiologic Principles of Anthrax \(Ft Detrick\)](#)
- [CDC Anthrax page](#)
- GSA anthrax training for government mail handlers
- [Center for Civilian Biodefense Studies \(Johns Hopkins\)](#)
- [USPS Suspicious Mail Alert Poster](#)
- [Biodetectors aim to broaden search for anthrax bacteria](#)
- [Nanosphere, Inc.](#), maker of gene chips.
- [DMOZ: Top: Society: Issues: Terrorism: Biological and Chemical Terrorism: Anthrax](#)
- [Timeline: Anthrax through the ages](#)
- [Public Safety Group](#) provides consulting on chemical/biological warfare, terrorism, and weapons of mass destruction to government agencies and contractors.
- A [heat seal roller](#) can be used to make continuous seams in polyethylene plastic. Polyethylene is a good material to use for containment because of its chemical and heat resistance and because nothing sticks to it. Unfortunately, adhesives are one of the things which don't stick.
- [DuPont Tyvek bio-terrorism info](#)
- [AMA Bio-terrorism articles](#)
- [Treatment of Biological Warfare Agent Casualties AFMAN-44-156\(I\)](#)
- [Public Health Image Library \(phil\)](#)
Their search form is a broken javascript monstrosity, so use this [alternative search form](#).
- The [Aerobiological Engineering](#) folks at PSU have lots of information including [a large table of pathogens](#) with info such as their size. And their [Airborne Pathogens Database](#) has images on other pathogens
- [WHO outbreak news](#)



This page may contain errors. I have tried to minimize those but some may have crept in. You are responsible for verifying the information before relying on it and for carefully evaluating the potential application of the information to your unique circumstances. This information is provided free of charge without any warranty and the author is not responsible for any harm which may come from the use or misuse of the information. This site is not medical advice.



As this site was prepared to deal with an emergency situation, I haven't had time to credit everyone as carefully as I would like. Information came from the CDC, DOE, LLNL, Fort Detrick, JHU Center for Civilian Bioterrorism, the US Army, OSHA, FEMA, GSA, the AMA, USPS, the book *_Germes_*, Biosafety in Microbiological and Biomedical Laboratories, newswire articles, and a whole bunch of websites most of which are linked to somewhere on this page. Some of the linked websites were my original source for information, in others the information was already part of my general knowledge but I searched for a site which could provide more information to others. I have tried to weigh the information from various sources according to the levels of competence and bias of the sources.



The author has worked in a variety of research and development laboratories in the military, academic, and private sectors, though almost none of that work was biological. He has been doing some research on sterilizing and decontamination for the last two years. He has traveled the third world during a cholera outbreak and worked at high altitude. One of his ancestors was responsible for public health measures which helped reduce the incidence of malaria in central America. He is coauthor of a computer programming book. He has combined his skills from a variety of disciplines including computer security and facility security, scientific laboratory research, electronics, mechanical engineering, astronomy, aerodynamic simulation, first aid/CPR, nutrition, math, disinfection and sterilization, computer assisted research, computer viruses and worms, zymurgy, pressurized and vacuum systems, computer simulation, and writing to create this document. As a security expert, he has experience thinking from the attacker's point of view to create effective defense strategies. The author is currently available for consulting projects and permanent hire positions.

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Senior Engineer for hire

Software Development - Electronic Design - Embedded Systems - Device Drivers -
System/Network Administration and Security - Motor Control, RobotCNC - Linux/Unix - 25+
years experience

The author of these pages is looking for a new gig.

[\[RESUME\]](#)

Engineers and electronic hobbyists: The new [Open Symbol Project](#) is creating open schematic symbols and PCB footprints for a variety of different CAD packages.

Mark Whitis' s Websit e	Hom e Page	Linu x	Book: Linux Programmi ng Unleashed	My Resum e	Genealogic al Data	Conta ct Info	Securit y	Abou t
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All email messages received must pass the [turing test](#) or they will be considered SPAM. If it could have been written by a machine, it was.

Under no circumstances are you to email me with questions regarding windoze, any other microsoft operating system or application, or any software which runs under any form of windoze.