

ADVANCED ENVIRONMENTAL DISINFECTION

The Complete Guide to Eliminating Pathogens in any Environment

FIRST EDITION

BY

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He strictly forbids reproduction without his permission, which proves again he is declaring to the world that he wrote all the contents of this "book" unless he gives another credit.

In this "book" we have documented approximately 300 instances of plagiarism (theft), copyright infringement, trademark infringement, and piracy.

In this document we will prove to you that Berg is a thief, a charlatan, and a fraud.

Berg has no regard for the law and no qualms about stealing the work of others and presenting it to the world as his own.

This book is dedicated to...

Cheryl, Kelly and Jessica for who you are and how much you mean to me.

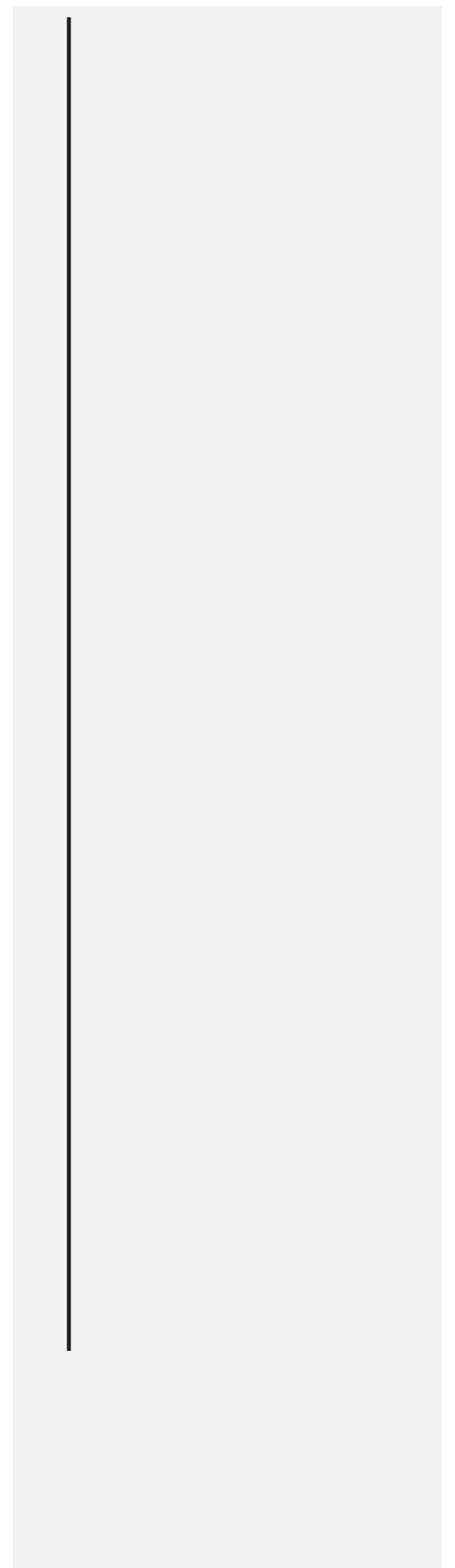


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PREFACE

THE CURRENT STATE OF ENVIRONMENTAL INFECTIOUS DISEASE

Whether naturally occurring or intentionally inflicted, infections can cause illness, disability, and death in individuals while disrupting whole populations, economies, and governments. And because of international travel, it only takes one infected person to turn one nation's problem into every nation's problem. Since 1992 according to the Institute of Medicine the impact of infectious diseases on the United States has only increased. Heretofore unknown emerging diseases are being joined with known diseases that were thought to be virtually eradicated. Mark Woolhouse, chair of Infectious Disease Epidemiology at the University of Edinburgh, has counted 38 new pathogens that have moved into the human population from other animal species in just the past 25 years. Compounding the danger posed by these infectious diseases are the increase in antimicrobial resistance and the intentional use of biological agents by terrorists intending to do us harm.

We must do more to improve our ability to prevent, detect, and control emerging – as well as resurging-microbial threats to health. Traditionally in human health, efforts have concentrated on vaccinating to prevent the spread of disease, and developing new treatments for the disease. However, the true foundation of managing infectious disease is prevention. It is much more cost effective to reduce or eliminate the risk of infectious illness prior to infection than to treat the infected individuals or population once the infection has established itself. A critical piece of the prevention process is disinfection. Without this critically important step, vaccination and medication cannot be fully effective.

Comment [2]: Berg sets the stage for this so-called book by plagiarizing the works of others to create his preface.

This is absolutely pitiful; he couldn't even write his own preface.

Comment [3]: Plagiarized from the Institute of Medicine's March 2003 report, *Microbial Threats to Health: Emergence, Detection, and Response*.

Comment [4]: Plagiarized from the Institute of Medicine's March 2003 report, *Microbial Threats to Health: Emergence, Detection, and Response*.

Comment [5]: Almost verbatim (Berg deleted three words) from *Infected Planet*, written by Stan Cox (March 20, 2006), on Alternet.org, http://www.alternet.org/story/33703/infected_planet

Comment [6]: Plagiarized from the Institute of Medicine's March 2003 report, *Microbial Threats to Health: Emergence, Detection, and Response*.

Comment [7]: Plagiarized from http://www.mcc-cellai.com/english_version/virkon7.htm

WARNING: The Importance of Protecting Employee Health and Safety:

Performing any of the processes included in this manual has the potential to expose technicians to a variety of health hazards. In order to protect these workers, training in a number of safety and health programs will be necessary, including those mandated by local, state and federal regulations and guidelines. The company should implement a Health and Safety Plan, a Hazard Communication program, a Respiratory Protection program, a Bloodborne Pathogens program, and other programs depending upon the services the technicians are expected to perform.

Inoculations also play an important role in protecting technicians. A minimum recommendation would include Hepatitis A, Hepatitis B and Tetanus. Other inoculations are indicated when there may be exposure potential and the inoculations are available.

All technicians should be evaluated by a physician to determine the health of their immune system prior to assigning any work. A medical history and physical exam should be performed with attention to cancer, steroid therapy, immunodeficiencies, pulmonary disease, diabetes mellitus, and other immunocompromising states.

NOTE:

Not everyone is at risk from every pathogen. There are a myriad of factors that influence whether a person contracts a disease. Genetic factors, exposure time, immune system status, dose virulence of agents, environmental factors, current medications used (immune system suppressors), sensitivity, and antigenicity, all play roles in an individual's susceptibility to disease.

Comment [8]: Plagiarized from <http://www.localrestoration.com/Guidelines-For-Sewage-Remediation>

**CHAPTER
1
The World of Microbes**

Chapter 1 The World of Microbes

Microbes were here before us and they will be here long after the human race is gone. They are hearty and they have a great ability to adapt to even the most inhospitable environments. While some microbes cannot live long outside their hosts, researchers have been astonished to find extreme cases of survival where microbes have adapted to inhospitable environments through mutation. The saying "that which does not kill you makes you stronger" certainly applies to these simple life-forms.



Case Example 1:

In 2000, researchers from West Chester (Penn.) University claimed to have discovered the oldest known microorganism in an ancient salt deposit in New Mexico, buried 610 meters (2,000 feet) below ground. It was trapped in a tiny brine-filled pocket that formed in a salt crystal 250 million years ago. Long before the dinosaurs became extinct 65 million years ago, it lay in a dormant state, waiting for the right conditions to "awaken" its genetic machinery and resume growing and reproducing, the researchers said.

Case Example 2:

In the Arctic and Antarctic, scientists have found metabolically active microbes in subsurface permafrost frozen at temperatures of -10 °C (14 °F) or colder for 2 million to 3 million years. High populations of viable microbes have been found in oceanic sediment cores deeper than a half-kilometer, which would make them older than 10 million years.

Case Example 3:

In the 1950s, tuberculosis was thought to have been wiped out through a concerted international effort using then state-of-the-art antibiotics. Over a half a decade later, while we thought it was no longer a threat, it was quietly mutating, building immunity to all but the most powerful contemporary drugs of the 21st century. Known in the medical community as Extreme (or, Extensively) Drug Resistant (XDR) Tuberculosis, it has returned with a vengeance, killing more people worldwide than any other infectious disease, with 8 million new cases and 2.9 million deaths each year.

Comment [9]: Plagiarized from *Is Life Thriving Deep Beneath the Seafloor?*

"Recent discoveries hint at a potentially huge and diverse subsurface biosphere"

By Carl Wirsen Originally published online April 12, 2004: In print Vol. 42, No. 2, Apr. 2004, <http://www.whoi.edu/oceanus/viewArticle.do?id=2497>

Comment [10]: Plagiarized from *Is Life Thriving Deep Beneath the Seafloor?*

"Recent discoveries hint at a potentially huge and diverse subsurface biosphere"

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Comment [11]: Plagiarized from the National Institutes of Health website, <http://grants.nih.gov/grants/guide/rra-files/RFA-AI-93-003.html>;

however, the original article is from *Science*, Vol. 21, p 1055-1064, printed August 21, 1992. Not only is this statistic plagiarized, it is completely out of date by 21 years.

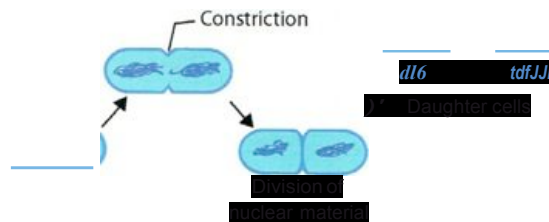
The World of Microbes.

Micro means small. *Microbes* literally means small organism. These organisms are so small they can only be seen through a microscope. Scientific nomenclature assigns each organism two names. The genus, the first name, is always capitalized, and the specific epithet (species), which follows, is not capitalized. Most microbes are not harmful and indeed play a vital role in maintaining our environment. Many are actually useful to us. The safe useful ones are called non-pathogens because they do not produce disease. Microbes that cause disease in humans are called pathogens or pathogenic organisms. Infection occurs when these pathogens invade the body and cause disease. Microbes can be classified into the following categories: Bacteria, Viruses, Fungi, Protozoa, Algae, and Helminths, (for part of their life cycle).

BACTERIA:

Bacteria are found everywhere in our environment. They are present in soil, in water, and in the air. Bacteria are also present in and on the bodies of all living creatures-including people. Most bacteria do not cause disease, in fact many bacteria carry out useful and necessary functions related to the life of larger organisms. However, when we think about bacteria in general terms, we usually think of the health hazards they cause.

Bacteria have a very simple cellular structure and lack a nuclear membrane (a sac-like structure in a cell that contains



the cell's genetic material). Instead, the genetic material (DNA) floats free in the cell. The normal method of replication for bacteria is Binary Fission. In Binary Fission, bacterial cells simply increase their cell mass slightly, replicate their DNA (and several other components), and then each cell divides equally into two daughter cells. Bacteria are capable of extremely rapid cell replication, multiplying at geometric growth rates. This makes them a danger when they invade human or animal tissue. Dividing every ten minutes, a single bacterial cell can produce a mass consisting of over a million cells in less than three hours.

Bacteria come in 3 shapes: elongated rods called bacilli, rounded or spherical cells called cocci, and spirals (helical and curved) called spirilla (for the less rigid form) and spirochaete (for those which are flexible). Some bacteria are saprophytic (feeding on non-living organisms) and oth-

Comment [12]: Plagiarized from *Nursing Assistant: A Nursing Approach*, by Hegner, Acello, and Caldwell.

Comment [13]: Plagiarized from *Microbiology: An Introduction*, by Tortora, Funke, and Case. Textbook from Pearson (pearsoned.com). "Piracy...is the unauthorized use of copyrighted material...that violates one of the copyright owner's exclusive rights, such as the right to...distribute a work to the public by sale...."

Comment [14]: Plagiarized from *Nursing Assistant: A Nursing Approach*, by Hegner, Acello, and Caldwell.

Comment [15]: Plagiarized from *Nursing Assistant: A Nursing Approach*, by Hegner, Acello, and Caldwell.

Comment [16]: Almost verbatim from the section titled "Bacteria" in *Biology for Nonbiologists* by Frank R. Spellman, copyright 2007. This paragraph is used a number of times in Spellman's other copyrighted textbooks; published at least as early as 2007.

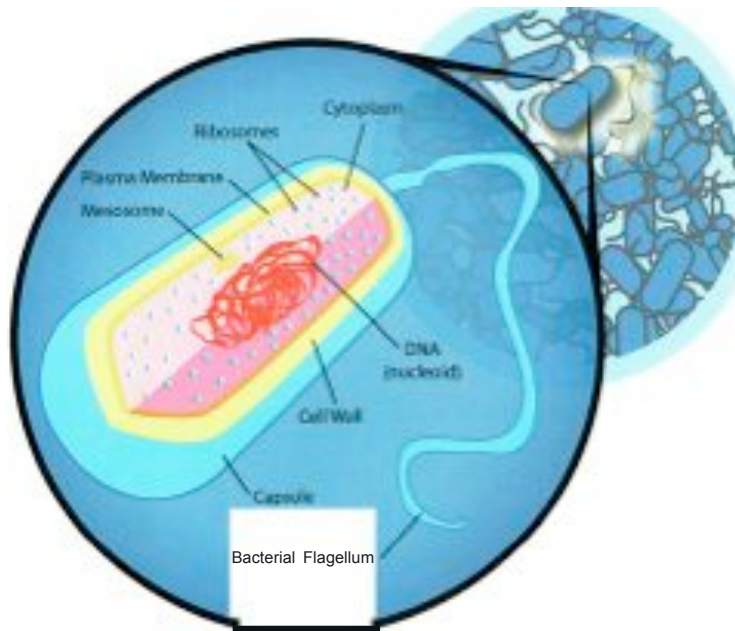
Comment [17]: Found very quickly by searching for "simply increase their cell mass slightly." We found numerous instances available online at "pay per essay" sites; for example: <http://www.freepaperz.com/paper/Bacterial-Cell-Replication-and-cell-changes/stages-summarized.-148022.html>, and on paperary.org, and vipessays.com, and essaywizards.com, and writework.com, and molaah.com, etc.

ers are parasitic (feeding on living organisms).

Bacteria that use molecular oxygen are aerobes; if oxygen is an absolute requirement, they are obligate aerobes. Facultative anaerobes use oxygen when it is present but continue growth by fermentation or anaerobic respiration when it is not available. Facultative anaerobes grow more efficiently aerobically than they do anaerobically. Obligate anaerobes are bacteria totally unable to use oxygen for growth and usually find it toxic. Obligate pathogens must cause disease in order to be transmitted. Opportunistic pathogens can be transmitted from one host to another without causing disease, i.e. Legionella, Staph A, and pseudomonas a

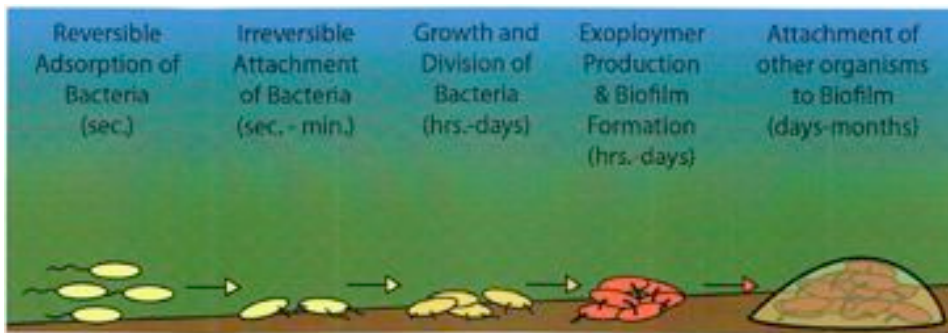
All pathogenic bacteria are mesophiles. (Those that thrive at temperatures 10-40 degrees Celsius or 50-104 degrees Fahrenheit).

Comment [18]: Almost completely verbatim from Chapter 6 of Microbiology: An Introduction, Eighth Edition Gerard J. Tortora. We found it here, http://www.ahsd.org/science/moss/Microbiology/StudyGuides/Ch06_Micro8eStudyGuide.pdf under the heading Chemical Requirements, Oxygen.



BIOFILM:

Scientists are finding germs are apparently smarter, tougher and more organized than anyone ever imagined. Recent discoveries have shown that when bacteria find a receptive environment where they are exposed to food and moisture, they often do not remain as isolated and free-floating life forms, but communicate and colonize with other germs. The microorganisms work together as a population and secrete a sticky exopolymer to form a tough, protective layer over the colony called biofilm. The biofilm is really a jelly-like mass, about 80% slime and 20% cells which can withstand assault by many commonly used hospital disinfectants. Once a biofilm is established, it is very difficult to eliminate because the microbes are reinforced and protected by the matrix. Using common antimicrobials (Quaternary, Phenolic) may not remove a biofilm colony. Since the antimicrobial must be able to get to the germs embedded in the biofilm matrix, the film must be broken down before the germs are vulnerable. Oxidizing agents such as hydrogen peroxide or sodium hypochlorite actually use the oxidation (burning) process to penetrate and break down the film. Another method is to physically brush the slime and break it up. A third way is to use Low Vapor Steam. Concentrated steam of 215 to 230 degrees emulsifies the slime and destroys the pathogens within.



Gram-negative and Gram-positive Bacteria

The Gram Stain, named after its developer, Danish bacteriologist Christian Gram, has become an important tool in bacterial taxonomy, distinguishing between so-called gram-positive bacteria, which remain colored after the staining procedure, and gram-negative bacteria, which do not retain the dye. The way they stain has to do with the composition of their cell walls. Unlike gram-positive bacteria that have a single-cell membrane, gram-negative bacteria have a double-cell membrane. This helps shield the bacteria from antibiotic treatment, making them difficult to eradicate. Gram-negative bacteria can be found most abundantly in the human body in the gastrointestinal tract, i.e. salmonella, shigella, e.coli and proteus organelle. Gram-positives may

Comment [19]: Plagiarized from http://www.housekeepingchannel.com/a_98-Are_You_Winning_the_Battle_with_Biofilm

Comment [20]: Plagiarized from <http://www.hygiene.net/faq-04.html> "What is a biofilm?" (2005)

Comment [21]: Plagiarized from <http://webbertraining.com/files/library/docs/116.pdf>, second paragraph, page 8. Presented by Dr. Bill Costerton for Johnson Wax Professional, "Essential Knowledge in the Battle Against Biofilms."

Comment [22]: Plagiarized from <http://www.hygiene.net/faq-04.html> "What is a biofilm?"(2005)

Comment [23]: Plagiarized from http://www.housekeepingchannel.com/a_98-Are_You_Winning_the_Battle_with_Biofilm

Comment [24]: Plagiarized from the Columbia Encyclopedia, <http://education.yahoo.com/reference/encyclopedia/entry/Gramssta>.

Comment [25]: Plagiarized from <http://www.infectioncontroltoday.com/articles/2003/09/infection-control-today-09-2003-gram-negative-and.aspx>

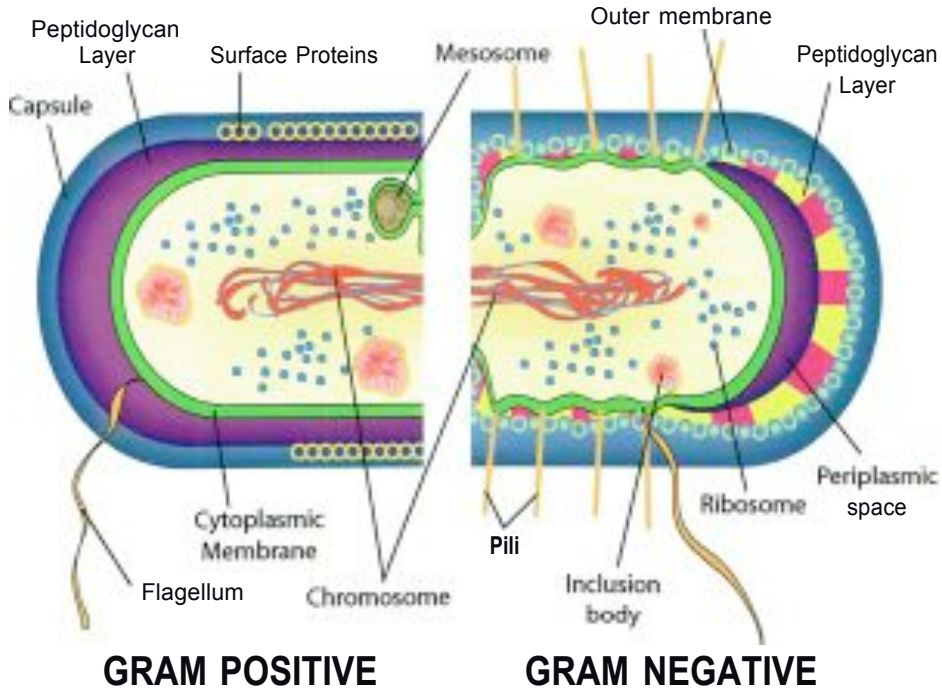
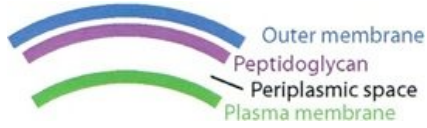
Comment [26]: Plagiarized from http://www.kaivac.com/n_109-Doctors_Have_No_Way_to_Treat_Growing_Bacteria_Threat_More_Effective_Cleaning_Appears_to_Be_Only_Defense

also be found there, but also can reside *outside the body* on mucous membranes such as the mouth, vagina or the skin.

Comment [27]: Almost verbatim (Berg added the phrase “outside the body.” I guess he thinks that makes it not plagiarism.) from <http://www.infectioncontroltoday.com/articles/2003/09/infection-control-today-09-2003-gram-negative-and.aspx>

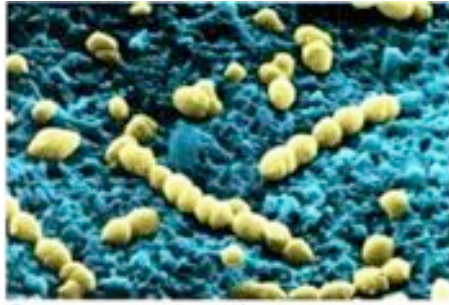
GRAM POSITIVE

GRAM NEGATIVE



Aerobic Gram+

- Staphylococcus aureus*
- Staphylococcus epidermidis*
- Staphylococcus sp.*
- Streptococcus pneumoniae*
- Streptococcus agalactiae*
- Streptococcus pyogenes*
- Enterococcus*
- Bacillus anthracis*
- Bacillus cereus*
- Bifidobacterium bifidum*
- Lactobacillus*
- Listeria monocytogenes*
- Nocardia sp.*
- Rhodococcus equi*
- Erysipelothrix rhusiopathiae*
- Corynebacterium diphtheriae*
- Propionibacterium acnes*



Streptococcus pneumoniae

Anaerobic Gram+

- Actinomyces sp.*
- Bacillus subtilis* - bacterial spore, (facultative anaerobe)
- Bacillus anthracis* - bacterial spore, (facultative anaerobe)
- Clostridium botulinum* - bacterial spore
- Clostridium difficile* - bacterial spore
- Clostridium perfringens* - bacterial spore
- Clostridium tetani* - bacterial spore
- Clostridium sporogenes* - bacterial spore, most resistant to antimicrobials
- Moryella sp.*
- Peptostreptococcus sp.*



Clostridium difficile

Pseudomonas aeruginosa - vegetative bacteria, easy to kill

Burkholderia cepacia

Burkholderia pseudomallei

Xanthomonas maltophilia

Stenotrophomonas maltophilia

Anaerobic, Gram-

Bacteroides fragilis

Bacteroides sp.

Prevotella sp.

Bifidobacterium sp.



NOTE: there are some bacteria which cannot or are difficult to Gram stain

Chlamydia trachomatis

Chlamydia pneumoniae

Chlamydia psittaci

Legionella sp.

Mycobacterium bovis

Mycobacterium tuberculosis - mycobacteria, most resistant to disinfectants

Mycobacterium avium

Rickettsia rickettsii

Many bacteria have a defense mechanism to protect themselves when they encounter a threat.

They produce toxins. A toxin is a chemical poison that can be used to repel, disable or kill.

Toxigenesis is the ability to produce toxins. At a chemical level, there are two main types of bacterial toxins, lipopolysaccharides and proteins.

Endotoxins are lipopolysaccharide toxins that are actually part of the cell structure called the cell envelope (cell wall). Endotoxins are associated with gram-negative bacteria. Sometimes these toxins are naturally released as the cells grow, causing infection at the site of the bacterial infestation. Greater amounts of Endotoxin may be released as a result of bacterial cell damage from attack by the host's antibodies or when the bacteria dies and the walls disintegrate. These toxins usually only affect the site of infection.

Comment [28]: Plagiarized from <http://textbookofbacteriology.net/proteintoxins.html>

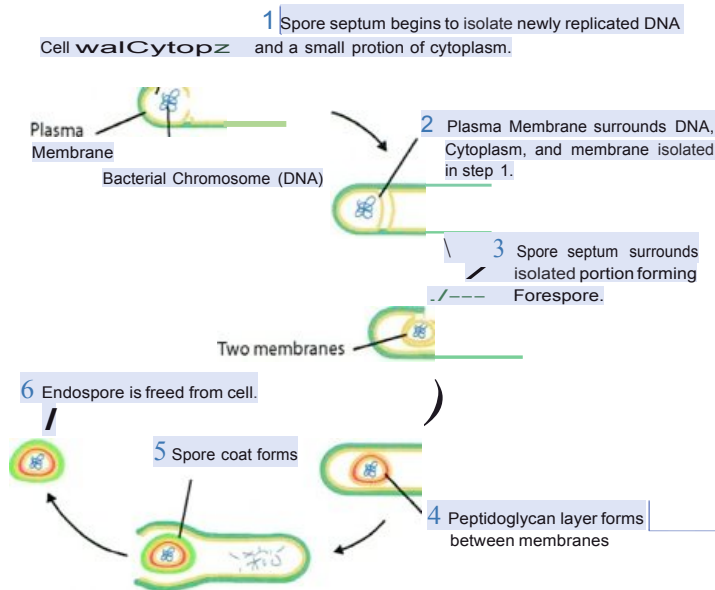
Exotoxins are usually proteins that act enzymatically or through direct action from the cells of both Gram positive and negative bacteria. These proteins are extremely powerful biological poisons that can be secreted by the bacteria or released when the cell is damaged or dies. These toxins often spread throughout the body causing widespread infection and damage.

Vegetative bacteria are those bacteria or microorganisms in the state of growing or reproducing. The actively growing bacteria in these conditions are referred to as "vegetative cells". Some vegetative bacteria are capable of spore forming. As the vegetative organism strives to protect itself from undesirable environmental conditions, it assumes its spore form. The spore acts as a protective shield, helping to prevent damage or death from an inhospitable environment.

Spore-Forming Bacteria

There are two types of spore-forming bacteria: Bacillus and Clostridium. Both are rod-shaped, Gram+ anaerobes, but Clostridium is an obligate anaerobe, meaning it grows only in the absence of oxygen. Bacillus contains species that can grow both with and without oxygen; thus we call these bacteria facultative anaerobes.

Spore strips of *Bacillus subtilis* or *Bacillus stearothermophilus* (which are nonpathogenic bacillus that make spores) are so hard to kill, they are used to test the efficacy of autoclaves (the device used to sterilize surgical instruments in hospitals).



Comment [29]: Plagiarized from <http://textbookofbacteriology.net/proteintoxins.html>

Comment [30]: From the original source: "As the organism strives to protect itself from undesirable environmental conditions, it assumes its spore form." Plagiarized from http://www.apic.org/Resource/_EliminationGuideForm/5de5d1c1-316a-4b5e-b9b4-c3f9eac1b53e/File/APIC-Cdiff-Elimination-Guide.pdf

Comment [31]:
Do you really think Berg created this art work? Really? He does not give credit to the source of these and similar images.

Clostridium tetani, *Clostridium botulinum*, and *Clostridium perfringens* are spore forming, gram-positive anaerobic bacteria. They are feared because they produce such potent toxins (exotoxins). *Botulinum toxin produced by the bacteria Clostridium botulinum, is the most poisonous substance known*. The bacteria grows on, e.g. poorly preserved food and causes a severe form of food-poisoning (botulism). The incubation period is between one and three days after which the victim becomes ill with stomach pains, diarrhea, disturbances to vision, giddiness and muscular weakness. The whole body, including the respiratory musculature, becomes paralyzed which leads to death by suffocation within a few days.

VIRUSES:

Viruses are parasitic intracellular particles that are the smallest "living" infectious agents known. They are not cellular—they have no nucleus, cell membrane, or cell wall. Viruses, like cells, carry genetic information encoded in their nucleic acid, and can undergo mutations and reproduce; however they cannot carry out metabolism, and thus are not considered truly "alive". They multiply only within living cell (hosts) and are totally inert outside of living cells but can survive in the environment. When not in contact with a host cell, the virus remains entirely dormant, and in essence is no more than a static organic particle. In this state it is referred to as a "virion". Virions can remain in this dormant state for extended periods of time, waiting patiently to come into contact with the appropriate host. When this occurs, it becomes active and is then referred to as a virus. Viruses differ from living cells in at least 3 ways: (1) they are unable to reproduce independently of host cells and carry out cell division; (2) they possess only one type of nucleic acid, either DNA or RNA, and (3) they have a simple cellular organization.

A virus consists of two or three parts: Genes, made from either DNA or RNA, long molecules that carry the genetic information; a protein coat that protects the genes; and some viruses have an envelope of fat that surrounds and protects them when they are not contained within a host cell. Viruses vary in shape from the simple helical and icosahedral to more complex structures. Viruses are about 100 times smaller than bacteria. It would take 30,000 to 750,000 of them, side by side, to stretch to 1 centimeter (0.39 in).

Viruses spread in many different ways. Plant viruses are often spread from plant to plant by insects and other organisms known as *vectors*. Some viruses of animals are spread by blood-sucking insects. Each species of virus relies on a particular method. Whereas viruses such as influenza are spread through the air by people when they cough or sneeze, others such as norovirus, which are transmitted by the fecal-oral route, contaminate hands, food and water.

Comment [32]: Plagiarized from A FOA Briefing Book on Chemical Weapons, which came out in 1992. This paragraph about botulism is found in a number of places online, all of which give credit to the original source.

Comment [33]: Plagiarized from from the section titled "Viruses" in *Biology for Nonbiologists* by Frank R. Spellman, copyright 2007. This paragraph is used a number of times in Spellman's other copyrighted textbooks; published at least as early as 2007.

Comment [34]: Plagiarized from <http://www.dform.com/projects/t4/virus.html>





Comment [35]: And AGAIN, complete plagiarism. Plagiarized from the section titled "Viruses" in *Biology for Nonbiologists* by Frank R. Spellman, copyright 2007. This paragraph is used a number of times in Spellman's other copyrighted textbooks; published at least as early as 2007.

Antibiotics have no effect on viruses, but antiviral drugs have been developed to treat life-threatening infections. Vaccines that produce lifelong immunity can prevent some infections.

When a virus infects a cell, the virus forces it to make thousands more viruses. It does this by making the cell copy the virus's DNA or RNA, making viral proteins, which all assemble to form new virus particles. Regardless of the type of host cell, all viruses follow the same basic steps in what is known as the lytic cycle.

- A virus particle attaches to a host cell.
- The particle releases its genetic instructions into the host cell.
- The injected genetic material recruits the host cell's enzymes.
- The enzymes make parts for more new virus particles.
- The new particles assemble into new viruses.
- The new particles break free from the host cell.

All viruses have some type of protein on the outside coat or envelope that "feels" or "recognizes" the proper host cell(s). This protein attaches the virus to the membrane of the host cell. Some enveloped viruses can dissolve right through the cell membrane of the host because both the virus envelope and the cell membrane are made of lipids. Those viruses that do not enter the cell must inject their contents (genetic instructions, enzymes) into the host cell. These are called non-lipid or "naked" viruses. Those viruses that dissolve into a cell simply release their contents once inside the host. In either case, the results are the same. "Enveloped" viruses, also known as medium viruses, include HIV, HBV, herpes and hantavirus. Examples of "non-enveloped" or small viruses include *pojjovirus*, *norovirus*, *rhinovirus* or *coxsackjevirus*.

	DNA viruses	RNA viruses
Enveloped	 <p>Herpesvirus</p>	 <p>Retrovirus</p>
Non-enveloped	 <p>Adenovirus</p>	 <p>Picomavirus</p>

Comment [36]: Plagiarized from Wikipedia, almost verbatim. http://en.wikipedia.org/wiki/Introduction_to_viruses

Berg uses Wikipedia entries throughout this "textbook." Wikipedia content is copyrighted. A person may reuse the content only if he/she releases any derived work under the Creative Commons Attributions/Share-Alike license. Obviously, by claiming copyright to his books and profiting from them and not allowing others to freely copy them, Berg does not comply with this licensing agreement and is therefore violating Wikipedia's copyright agreement. Berg must feel he is above the law.

Comment [37]: Plagiarized from http://en.wikipedia.org/wiki/Introduction_to_viruses#cite_ref-30; however, the wiki author cites his/her source for this information, which is *Understanding Viruses* by Teri Shors (2008). Ms. Shors is frequently cited in the wiki article so it would be safe to assume that her book forms the basis of much of the wiki material.

Comment [38]: Plagiarized from <http://science.howstuffworks.com/like/cellular-microscopic/virus-human2.htm> written by Craig Freudenrich, Ph D

Comment [39]: Plagiarized from <http://science.howstuffworks.com/like/cellular-microscopic/virus-human2.htm> written by Craig Freudenrich, Ph D

MOLD (FUNGI)

Fungi constitute a large and diverse group of organisms. The kingdom of fungi is divided into four major groups: conjugating fungi, sac fungi, club fungi, and imperfect fungi. Mushrooms, molds, yeasts, and mildew are all fungi. Biologists have estimated that there are more than 200,000 species of fungi in nature, although only about 100,000 have been identified so far. The scientific study of fungi is called mycology.

General characteristics

The different groups of fungi have different levels of cellular organization. Some groups consist of single-celled organisms that have a single nucleus per cell. (A nucleus is a membrane-enclosed structure within a cell that contains the cell's genetic material and controls its growth and reproduction.) Other groups consist of single-celled organisms in which each cell has hundreds or thousands of nuclei. Still others consist of multicellular organisms that have one or two nuclei per cell. The bodies of multicellular fungi usually consist of slender, cottony filaments called hyphae. A mass of hyphae is called a mycelium. The mycelium carries on all the life-maintaining processes of the organism including sexual reproduction (in most species). Unlike plants, fungi do not contain chlorophyll (green pigment) and thus cannot create their own food through photosynthesis (the chemical process by which plants containing chlorophyll use sunlight to convert carbon dioxide and water to carbohydrates, releasing oxygen as a by-product).

Most species of fungi grow on land and obtain their nutrients from dead organic matter. Most species feed by secreting enzymes, which partially break down the food. The fungi then absorb the partially digested food to complete digestion internally. Because fungi (along with bacteria) help decompose dead plants, animals, and other organic matter, they serve an important ecological role. They release large amounts of carbon dioxide into the atmosphere and recycle nitrogen and other important nutrients for use by plants and other organisms.

Some fungi are parasites, living in or on another organism (called a host) from which they obtain their nutrients. This relationship usually harms the host. Such parasitic fungi usually have specialized tissues called haustoria that penetrate the host's body. Most of the diseases that afflict agricultural plants are caused by parasitic fungi. Some examples are corn smut, black stem rust of wheat and barley, and cotton root rot. Some species of fungi also can parasitize animals. Fungi that parasitize humans cause diseases such as athlete's foot, ringworm, and yeast infections.

Allergic Illness

When mold cells are inhaled and land in the respiratory tract, the body's immune system's response to those invading cells can cause a allergic illness. The immune system tries to destroy the

Comment [40]: Plagiarized from <http://www.amazon.com/U-X-L-Encyclopedia-Science-Volume-set/dp/0787617164>, edited by David E. Newton and Rob Nagel, (2002). This section was taken specifically from Fungi: An entry from UXL's *UXL Encyclopedia of Science* [HTML] [Digital], which we were able to purchase and download for \$4.90 from Amazon.

mold as it would an agent, like a flu virus, that might cause infection. In a relatively small portion of the population (about 10 percent of people in the U.S.), the immune system overreacts and causes the allergic response that results in symptoms such as runny nose, scratchy throat and sneezing. Most of us know this allergic illness as "hay fever" or "allergic rhinitis."

Asthma

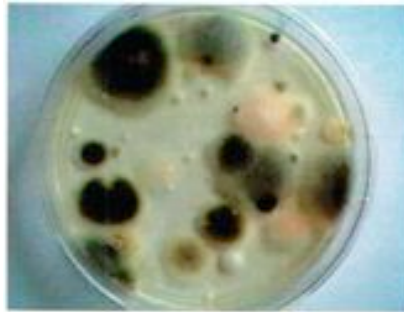
Asthma is a lung disease in which the airways that carry oxygen to the lungs can partially close, causing breathing difficulties ranging from mild (such as a dry cough) to life-threatening (inability to breathe). More than half of asthmatics have respiratory allergies, often to mold. Molds can trigger asthma episodes in sensitive asthmatics.

Irritation

Fungi produce Volatile Organic Compounds during the process of degrading substances to obtain nutrition. The VOCs are the cause of the typical "moldy/musty" odor commonly associated with fungal contamination indoors. Exposure to high levels of VOCs may irritate the mucous membranes and the central nervous system leading to symptoms of headaches, decreased attention span, difficulty in concentration, and dizziness.

Infection

Some mold species can cause respiratory infection when the live mold invades the tissues of the lungs or respiratory tract. This is not a significant risk for healthy people, but can be dangerous for individuals with severely weakened immune systems. Invasive Diseases are an opportunistic infection caused by exposure to microorganisms that don't normally produce disease in healthy individuals, but affects those persons with abnormally functioning immune systems.



For example, those with HIV/AIDS or those receiving immunosuppressive drugs such as transplant or chemotherapy patients. Some common fungi that have been associated with invasive disease are *Aspergillus*, *Cladosporium*, *Mucor*, and *Rhizopus*.

Toxic Effects

Very large doses of certain molds, whether inhaled or ingested, can result in poisoning caused by toxins called mycotoxins in the mold cells. It is not clear whether an individual can receive a high enough exposure to mold growing indoors to experience these toxic effects.

One particular type of mold that has been recently highlighted in the media is *Stachybotrys chartarum* (also known as *Stachybotrys atra*). *Stachybotrys* is a greenish-black mold that grows on materials with high cellulose content (drywall, wood, paper, ceiling tiles) that are chronically wet or moist. It is one of several molds that can produce mycotoxins under certain environmental conditions. The health effects of breathing mycotoxins are not well understood, but we

do know that most molds can present some health risks, such as allergic reactions. Therefore, any mold growth in a building should be cleaned up, regardless of the type of mold.

Symptoms of mycotoxin are:

Nausea- Sore throat-Coughing

Congestion- Skin rashes-Skin lesions

Nose bleeding- Blood in urine- Blood in feces

Fatigue- Depression- Diarrhea

Abdominal pains- Altered immune system

Headaches- Chills-Fever

Some of the characteristics of mycotoxins:

Odorless

Tasteless

Resistant to degradation

Production is variable

Produced on the surfaces of spores.

Who is affected by exposure to mold?

People who may be affected more severely and quickly than others include:

Infants and children

Elderly people

Pregnant women

Individual with respiratory conditions or allergies and asthma

Immunocompromised people

Comment [41]: This entire highlighted section and above starting with Allergic Illness is almost completely verbatim from <http://www.seeml.com/fungal%20center.html> (2006), which itself was taken from <http://epi.publichealth.nc.gov/oii/pdf/Mold%20and%20Human%20Health%208-18-05.pdf> (2005) from the North Carolina Department of Health and Human Services, Division of Public Health, Occupational and Environmental Epidemiology.

PRIONS

Prion: A disease-causing agent that is neither bacterial nor fungal nor viral and contains no genetic material. A prion is unlike all other known infectious agents, which must contain nucleic acids (either DNA, RNA, or both) along with protein components. Prions are responsible for the transmissible spongiform encephalopathies in a variety of mammals, including bovine spongiform encephalopathy (BSE, also known as "mad cow disease") in cattle and Creutzfeldt-Jakob disease (CJD) in humans. All known prion diseases affect the structure of the brain or other neural tissue and all are currently untreatable and universally fatal. Prions propagate by transmitting a misfolded protein state. When a prion enters a healthy organism, the prion form of a protein induces existing, properly-folded protein to convert into the disease-associated prion form; the prion acts as a template to guide the misfolding of more protein into prion form. These newly-formed prions can then go on to convert more proteins themselves, this triggers a chain reaction that produces large amounts of the prion form. The incubation period of prion diseases is determined by the exponential growth rate associated with prion replication. This altered structure is extremely stable and accumulates in infected tissue, causing tissue damage and cell death. Prion infection is always fatal.

Disinfection of Prions

Prions are resistant to denaturation by chemical and physical agents, making disposal and containment of these particles difficult. The possibility of infection from an environmental surface would be extremely rare, however, as prion-induced infections are normally related to direct introduction of infected tissue into a body through surgical intervention or punctures from an infected source such as an improperly sterilized surgical instrument. Although there are products on the market designed to inactivate prions on surfaces, their efficacy under the variety of environmental conditions faced in different venues is (as of this writing) unproven.

Comment [42]: Plagiarized from <http://en.wikipedia.org/wiki/Prion>
The majority is verbatim with a few words left out. The author/s of this wikipedia page—unlike Berg—cite their sources.

We went to the internet archive search engine ("Wayback machine") and found a wiki entry from April 2011 that is almost exactly the same as the highlighted area.

<http://web.archive.org/web/20110424004320/http://en.wikipedia.org/wiki/Prion>

Comment [43]: Plagiarized from <http://web.archive.org/web/20110424004320/http://en.wikipedia.org/wiki/Prion>

BIOHAZARD LEVELS

The United States' Centers for disease Control and Prevention (CDC) categorizes various diseases by levels of biohazard risk, Level 1 being minimum risk and Level 4 being extreme risk

Biohazard Level 1: *Bacillus subtilis, canine hepatitis, E. coli, varicella (chickenpox)*. At this level precautions against the biohazardous materials in question are minimal, most likely involving gloves and some sort of facial protection. Decontamination procedures for this level are similar in most respects to modern precautions against everyday viruses (ie: washing ones hands with anti-bacterial soap, washing all exposed surfaces of the lab with disinfectants, etc)

Biohazard Level 2: Bacteria and viruses that cause only mild disease to humans, or are difficult to contract via aerosol in a lab setting, such as *hepatitis A, B, and C, influenza A, Lyme disease, salmonella, mumps, measles, scrapie, dengue fever, and HIV*

Biohazard Level 3: Bacteria and viruses that can cause severe to fatal disease in humans, but for which vaccines or other treatments exist, such as *anthrax, West Nile virus, Venezuelan equine encephalitis, SARS virus, variola virus (smallpox), tuberculosis, ESE, typhus, Rift Valley fever, Rocky Mountain spotted fever, yellow fever, and malaria.*

Biohazard Level 4: Viruses, bacteria and prions that cause severe to fatal disease in humans, and for which vaccines or other treatments are *not* available, such as *Borrelia and Argentine hemorrhagic fevers, Dengue fever, Ebola, hanta virus, kansas virus* and other various hemorrhagic diseases (mostly of African descent). When dealing with biological hazards at this level the use of a Hazmat suit and a self-contained oxygen supply is mandatory. The entrance and exit of a level four biolab will contain multiple showers, a vacuum room, an ultra-violet light room, and other safety precautions designed to destroy all traces of the biohazard

Comment [44]: Plagiarized from http://web.archive.org/web/20060913000000/http://en.wikipedia.org/wiki/Biological_hazard

This is an archived version from 2006.

CHAPTER
2
The Body's Response to
Pathogens

DISEASE AND DEFENSE

With all of the pathogens in the environment, why don't more people get sick? The answer is that the human body has a number of defenses against disease. The body's first line of defense includes skin, mucous membranes in the nose and throat, tears, the tiny hairs in the nose, bleeding, urination, and sweating. These protectors either block harmful microbes from entering the body, or wash them away.

If pathogenic microbes get beyond the first line of defense, human blood has a second line of defense known as the immune system. If pathogenic microbes enter the bloodstream, they will be attacked by cells called macrophages (also known as white blood cells). These cells will attack and dissolve any foreign microbes.

Our bodies also produce antibodies that go after specific diseases. For example, if you have already had chicken pox, then your body's chicken pox antibodies will have been activated to prevent further infection. If you have received a vaccine for a particular disease, it helps your body create antibodies for that disease.

Development of Disease

The development of disease follows a certain sequence of steps. The incubation period is the time between actual infection and the first appearance of signs or symptoms. The prodromal period follows the incubation period in some diseases and is characterized by mild symptoms of the disease. During the period of illness, the overt symptoms of the disease are apparent. During the period of decline, the signs and symptoms subside. The patient regains his or her pre-diseased state during the period of convalescence.

Disease Transmission

In order for microbes to be passed from one host to another, there must be a chain of opportunity. This chain is made up of four links:

1. There must be a disease present in the host carrier.
2. There must be a method of transference from the host carrier.
3. There must be a portal for the disease to enter the new host.
4. There must be a way for the disease to enter the portal.



Comment [45]: This was plagiarized from *UNIT 1 Introduction to Infectious Diseases, Instructor's Background Text* from PKIDs' Infectious Disease Workshop. Berg changed a few words to change it from being geared to children; example, changing "peeing" to "urination" and "gobble" to "attack."

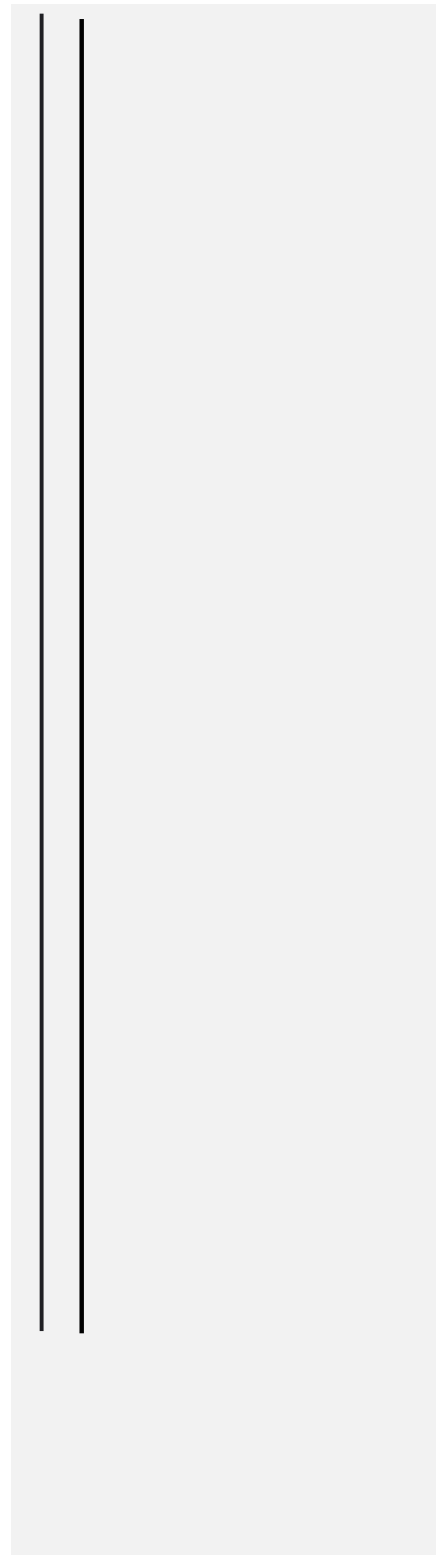
PKIDs stands for Parents of Kids with Infectious Diseases. PKIDs is a non-profit agency whose mission is "to educate the public about infectious diseases, the methods of prevention and transmission, and the latest advances in medicine; to eliminate the social stigma borne by the infected; and to assist the families of the children living with hepatitis, HIV/AIDS, or other chronic, viral infectious diseases with emotional, financial and informational support."

PKIDs is based out of Vancouver, WA. The copyright on this material is 2004-2008.

Wow. It is one thing to steal intellectual property from wikipedia but to steal from a non-profit that helps sick kids and their families? That is disgusting.

Comment [46]: Plagiarized from *Microbiology: An Introduction*, by Tortora, Funke, and Case.

CHAPTER
3
Fomites and Vectors



FOMITES:

A fomite is any inanimate object or substance capable of carrying infectious organisms and hence transferring them from one individual to another. A fomite can be anything (such as a desk, table, pencil, bedding, clothing, etc.), so when cleaning, it is important to remember that such items could aid the spread of pathogenic organisms. In an article by Kris Ellis published in *Infection Control Today*, November, 2006, German researchers explored the ability of infectious organisms to survive on inanimate surfaces. They found that most gram-positive bacteria including *vancomycin-resistant enterococcus (VRE)*, *methicillin-resistant Staphylococcus aureus (MRSA)*, and *Streptococcus pyogenes* can survive for months on dry surfaces. Many gram-negative species, such as *Aerobacter spp.*, *Escherichia coli*, *Klebsiella spp.*, *Pseudomonas aeruginosa*, *Serratia marcescens*, or *Shigella spp.* can also survive on inanimate surfaces for months. Mycobacteria – including *Mycobacterium tuberculosis* and spore-forming bacteria, including *Clostridium difficile*, survive multiple months on surfaces. Overall, the review noted that gram-negative bacteria persist for longer periods of time than gram-positive bacteria. Climatic factors can play a role in persistence as well — humid conditions were found to increase survival times for most types of bacteria, such as *Salmonella typhimurium*, *Pseudomonas aeruginosa*, and *Escherichia coli*. Only *Staphylococcus aureus* was found to persist longer at lower humidity.

VECTORS:

A vector is normally defined as a living organism that carries a disease from a host to a new potential host. While most vectors are arthropods, ie mosquitoes and ticks, any living creature can conceivably be a carrier of a disease that may be transmitted by way of bite or through its feces or urine. Deer mice are frequent carriers of hanta virus, while foxes are frequent carriers of the rabies virus. In the following chapters about birds, mammals, and rodents, you will learn more about diseases associated with their vectors.



CHAPTER
4
Site Evaluation and
Set-Up

Before any attempt is made at cleanup or remediation, a complete evaluation of the premises, scene, or site should be conducted in order to determine existing as well as potential health risks to the technicians as well as others once cleaning and remediation procedures are initiated. Ventilation ducts, air pressure differentials between floors or rooms, elevator shafts, and other zones that may be corridors or low-pressure areas may draft airborne contaminants from the source to other parts of the property. At this time, any areas of confirmed or suspected contamination should be presumed to contain infectious agents and should be posted with warning signs to that effect. The warning signs should be placed at the eye level of an average person and should include the hazard, the risk, and contact information (phone #) of the person in charge. In some cases, barriers may need to be erected or access limited by locks or other methods in order to ensure the safety of the public.

As in all hazardous clean up situations, all personnel should follow the OSHA regulations for health and safety, including general health and safety, PPE, HAZWOPER, Respiratory Protection, Hazard Communication, Heat, Confined Space and any other related regulations from OSHA, the EPA, FDA or other regulator agency. Remember that other hazards may be present that are not related to the primary contamination, but if disturbed are regulated health hazards. These include asbestos and lead paint.

CONTAINMENT:

When a contaminated area is identified, it should be immediately quarantined and contained using physical barriers. These barriers are to be designed to limit access to the site of contamination and to control the egress of persons who may be contaminated. If there is a concern that the contaminants can become airborne, then containment shall also include methods to

control the release of those contaminants into adjacent environments. Plastic sheeting can be erected to act as a barrier, and when practical, HEPA-filtered air scrubbers

can be used to create negative air pressure within the contaminated area. The primary containment is generally constructed of a 6 mil. poly-sheet barrier, secured on all sides. Any nearby ventilation ducts shall be sealed with poly sheeting and duct tape. Create a negative air pressure differential within the containment area using a HEPA-filtered air scrubber that is



vented to the outdoors. Antechambers, or airlocks should also be constructed so that those personnel needing to enter and exit the contaminated area can do so while minimizing the release of contagions. Additional containment may be required, such as sealing doorways. Consideration should be given to the method of removal of the waste from the site. If this requires travel through a building, then plastic runners should be placed on the floor to provide cross-contamination protection from workers boots. Access to these corridors should be restricted to workers only.

DESIGNATING SAFETY ZONES

In order to clarify and easily identify areas of hazard and relative safety, a simple system has been developed. The HOT ZONE (or red zone) is the area where the contamination is. The WARM ZONE (or yellow zone) is the controlled and often isolated area where contaminated personnel, equipment and supplies will travel to get from the HOT ZONE to the COLD ZONE (green zone) where it has been deemed safe for use or occupancy.

Decontamination stations should also be erected in order to decontaminate any person or object leaving the contaminated area. The decontamination area is an integral part of the WARM ZONE.

NOTE: Those persons intending to participate in outbreak control must complete an OSHA or EPA 40-hour HAZWOPER/HAZMAT course in order to become familiar with these practices and the use of advanced PPE.

A decontamination station should be set up adjacent to the HOT ZONE where personnel, equipment and waste can be decontaminated as they leave the HOT ZONE and enter the WARM ZONE (or yellow zone). It should be set in an area that can be easily and safely disinfected and should allow for future expansion, since it may be in use over a considerable period of time. When washing down personnel or equipment, the cleaning and rinsing liquids need to



be contained. Ideally, a kiddie pool should be set up on a flat surface. Foot baths and sprayers with a disinfectant should be available at this site for anyone entering or leaving the area. The decon area should be equipped with a HEPA-filtered vacuum to vacuum the suits and waste bags. A pump sprayer with disinfectant should also be utilized to spray down the suits, equipment and bags as necessary prior to exiting. Workers inside the HOT ZONE should not routinely carry out the waste, but instead, pass the contained waste out to workers in the WARM ZONE who will double-bag the waste, pass through a HEPA-vacuumed decon station, spray disinfectant on the outside bag, then carry the waste to the waiting dumpster or truck.

If the contamination is outdoors, remember that many disease agents can survive in the environment, including in mud, manure, or dirt that can be carried off-site by a vehicle. Therefore, all vehicles and trailers must be cleaned and disinfected before entering and leaving an outdoor quarantined or infected premise. Make sure the inside is also cleaned, including foot wells, pedals, steering wheel, controls, etc.



Personal Protective Equipment should be removed and disposed of as regulated medical waste while in the yellow zone.

Finally, all personnel should shower, wash their hair and put on clean clothes as soon as possible after exiting the yellow zone.

A first aid, eye-wash, rehab area should be set up in the COLD ZONE.

DISINFECTION:

As with all sites, clean all surfaces prior to applying a disinfectant. With outbreaks, generally large areas are involved. This could be a school, a farm, or an office building. When large areas are involved, more sophisticated disinfectant delivery devices may need to be employed in order to maximize the efficiency of the process.



**CHAPTER
5
"Cutting Edge"
Cleaning**

Transferring of contamination from surfaces to humans by way of touch is more efficient than previously thought. For contaminated hard, non-porous surfaces, these transfer rates can be in the 30-40 percent range. Porous surfaces, on the other hand have much lower transfer rates. Although porous surfaces may harbor more pathogenic microbes in their rough surface, it is more difficult for those microbes to be reached. High-Touch surfaces that are commonly found to harbor high levels of contamination include light switches, faucet handles, telephones, computer keyboards and mice, shopping cart handles, steering wheels, and desks. Remember that many common pathogens (bacteria and viruses) can survive on dry surfaces for hours, days, or even months.

CLEANING MICROBIAL CONTAMINATION

Cleaning is the removal of foreign material (e.g., soil, and organic material) from objects and is normally accomplished using water with detergents or enzymatic products. Thorough cleaning is required before final disinfection because *inorganic and organic materials that remain on the surfaces interfere with the effectiveness of the disinfectant*. Studies have shown that manual and mechanical cleaning also achieves a significant reduction of contaminating organisms. Thus, cleaning alone effectively reduces the number of microorganisms on contaminated surfaces. (The number of microbes living on a surface is referred to as bioburden.)



According to ISSA (International Sanitary Supply Association), there are three primary components in the process of cleaning with a room temperature cleaning solution: agitation, chemical, and time. These three components are usually known as the acronym ACT. They all work together in direct relationship with one another to accomplish a level of cleaning; if one is changed, one of both of the others must change as well to maintain cleaning effectiveness. For example, if dwell time is decreased then either agitation or chemical strength must be increased to compensate. But, when it comes to the removal of undesirable soils, the cleaning process has a greater impact than the cleaning chemical. In other words, for effective cleaning, chemistry may be important, but the process is critical. This notion has been demonstrated repeatedly in multiple field and laboratory tests that show that the cleaning process has a greater impact on the reduction of soil loads and bacteria than the chemical being used, which is contrary to the perception of most people. Bear in mind however, that it takes time for the detergency process to take place, i.e., for the surfactant to cover the surface and displace the soil.

Another way to increase the effectiveness of the cleaning process is to increase the temperature of the cleaning solution. Heat will assist in melting the soil that is being cleaned such as fat, grease or wax holding the soil, and it makes a tremendous difference in the rate of cleaning. You can use heat liberally as long as the material you are cleaning can tolerate it. The higher the heat, the better it is going to clean.



Rinsing away of soil and cleaning chemical is necessary and an agitated rinse is far more

Comment [47]: Plagiarized from Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008, from the CDC.

Comment [48]: Plagiarized from Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008, from the CDC.

Comment [49]: Plagiarized from http://www.kaivac.com/documents/GreenCleaning_WhtPpr.pdf. Written in 2008 for Kaivac

Comment [50]: Plagiarized from http://www.kaivac.com/a_63-Renewable_Cleaning_The_Right_Prescription_for_What_Ails_Us, written for Kaivac by Allen Rathey.

Comment [51]: Plagiarized from *What is your cleaning temperature?* From Volume 21, Issue 5 - May 2006, written by Aziz Ullah, Ph.D., MBA

Comment [52]: Plagiarized from *What is your cleaning temperature?* From Volume 21, Issue 5 - May 2006, written by Aziz Ullah, Ph.D., MBA

effective than a "still" rinse. The goal is to reduce or eliminate any residue left behind such as salts present in the water, accumulated soil, or the cleaning chemical itself.

Water comprises approximately 95-99% of cleaning solutions. Water functions to:

- carry the detergent to the surface;
- carry soils or contamination from the surface.

The impurities in water can drastically alter the effectiveness of a detergent or an antimicrobial. Water hardness is the most important chemical property with a direct effect on cleaning and disinfection efficiency. (Other impurities can effect the contact surface or may effect the soil deposit properties or film formation.) Water pH ranges generally from pH 5 to 8.5. This range is of no serious consequence to most detergents. However, highly alkaline or highly acidic water may require additional buffering agents. Water can also contain significant numbers of microorganisms. Water used for cleaning must be potable and pathogen-free. Treatments and sanitization of water may be required prior to use in cleaning regimes.

Cleaning:

Properties of Soils

Soil is generally defined as unwanted matter on surfaces. Soil is visible or invisible. The primary source of soil is from the environment. However, minerals from water residue and residues from cleaning compounds contribute to films left on surfaces. Microbiological bio-films also contribute to the soil buildup on surfaces. Since soils vary widely in composition, no one detergent is capable of removing all types. Many complex films contain combinations of dirt, proteins, surface oil or dust, insoluble cleaner components, and insoluble hard-water salts. These films vary in their solubility properties depending upon such factors as heat effect, age, dryness, time, etc. It is essential that personnel involved have an understanding of the nature of the soil to be removed before selecting a detergent or cleaning regime. The rule of thumb is that acid cleaners dissolve alkaline soils (minerals) and alkaline cleaners dissolve acid soils and proteins. Improper use of detergents can actually "set" soils, making them more difficult to remove (e.g., acid cleaners can precipitate protein). Many films and bio-films require more sophisticated cleaners which are amended with oxidizing agents (such as chlorinated detergents) for removal. Soils may be classified as:

- soluble in water (sugars, some starches, most salts);
- soluble in acid (limestone and most mineral deposits);
- soluble in alkali (protein, fat emulsions);
- soluble in water, alkali, or acid.

The physical condition of the soil deposits also effects its solubility. Freshly precipitated soil in

Comment [53]: Plagiarized from *What is your cleaning temperature?* From Volume 21, Issue 5 - May 2006, written by Aziz Ullah, Ph.D., MBA

Comment [54]: Plagiarized from *Basic Elements of Equipment Cleaning and Sanitizing in Food Processing and Handling Operations* by Ronald H. Schmidt, for the University of Florida IFAS Extension.

Footnote 1 above reads: This document is FS14, one of a series of the Food Science and Human Nutrition Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date July 1997. Revised March 2009. Reviewed January 2012. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

a cool or cold solution is usually more easily dissolved than an old, dried, or baked-on deposit or a complex film. Food soils are complex in that they contain mixtures of several components

Fat-based Soils

Fat usually is present as an emulsion and can generally be rinsed away with hot water above the melting point. More difficult fat and oil residues can be removed with alkaline detergents which have good emulsifying or saponifying ingredients. Protein-

based Soils

Proteins are by far the most difficult soils to remove. In fact, casein (a major milk protein) is used for its adhesive properties in many glues and paints. Proteins range from more simple proteins, which are easy to remove, to more complex proteins, which are very difficult to remove. Heat-denatured proteins can be extremely difficult. Generally, a highly alkaline detergent with peptizing or dissolving properties is required to remove protein soils. Wetting agents can also be used to increase the wettability and suspendability of proteins. Protein films require alkaline cleaners which have hypochlorite in addition to wetting agents.

Carbohydrate-based Soils

Simple sugars are readily soluble in warm water and are quite easily removed. Starch residues, individually, are also easily removed with mild detergents. Starches associated with proteins or fats can usually be easily removed by highly alkaline detergents.

Mineral Salt-based Soils

Mineral salts can be either relatively easy to remove, or be highly troublesome deposits or films. Calcium and magnesium are involved in some of the most difficult mineral films. Under conditions involving heat and alkaline pH, calcium and magnesium can combine with bicarbonates to form highly insoluble complexes. Other difficult deposits contain iron or manganese. Salt films can also cause corrosion of some surfaces. Difficult salt films require an acid cleaner (especially organic acids which form complexes with these salts) for removal. Sequestering agents such as phosphates or chelating agents are often used in detergents for salt film removal.

Microbiological Films

Under certain conditions, micro-organisms (bacteria, yeasts, and molds) can form invisible films (bio-films) on surfaces. Bio-films can be difficult to remove and usually require cleaners as well as sanitizers with strong oxidizing properties.

Lubricating Greases and Oils

These deposits (insoluble in water, alkali, or acid) can often be melted with hot water or steam, but often leave a residue. Surfactants can be used to emulsify the residue to make it suspendable in water and flushable.

Other Insoluble Soils

Inert soils such as sand, clay, or fine metal can be removed by surfactant-based detergents.

Comment [55]: Plagiarized from *Basic Elements of Equipment Cleaning and Sanitizing in Food Processing and Handling Operations* by Ronald H. Schmidt, for the University of Florida IFAS Extension.

Berg took the section called "Cleaning Properties of Food Soils" and eliminated the word "food."

Comment [56]: Plagiarized from *Basic Elements of Equipment Cleaning and Sanitizing in Food Processing and Handling Operations* by Ronald H. Schmidt for the University of Florida IFAS Extension.

Charred or carbonized material may require organic solvents.

Quantity of Soil

Heavy deposits require more detergent to remove. Improper cleaning can actually contribute to build-up of soil.

The Surface Characteristics

The cleanability of the surface is a primary consideration in evaluating cleaning effectiveness.

Included in surface characteristics are:

Surface Composition. Surfaces of soft metals and nonmetallic materials are generally less corrosion-resistant and care should be exercised in their cleaning. Aluminum is readily attacked by acids as well as highly alkaline cleaners which can render the surface non-cleanable. Plastics are subject to stress cracking and clouding from prolonged exposure to corrosive cleaning agents. Porous wood surfaces should be sealed or discarded. Pitted, cracked, corroded, or roughened surfaces are more difficult to clean or disinfect, and in fact may not be cleanable.

Thus, care should be exercised in using corrosive chemicals.

Environmental Considerations

Detergents can be significant contributors to the waste discharge (effluent). Of primary concern is pH. Many publicly owned treatment works limit effluent pH to the range of 5 to 8.5. So, it is recommended that in applications where highly alkaline cleaners are used, that the effluent be mixed with rinse water (or some other method be used) to reduce the pH. Recycling of caustic soda cleaners is also becoming a common practice in larger operations. Other concerns are phosphates, which are not tolerated in some regions of the U.S., and the overall soil load in the waste stream which contributes to the chemical oxygen demand (COD) and biological oxygen demand (BOD).

Chemistry of Detergents

Detergents and cleaning compounds are usually composed of mixtures of ingredients that interact with soils in several ways:

- Physically active ingredients alter physical characteristics such as solubility or colloidal stability.
- Chemically active ingredients modify soil components to make them more soluble and thus easier to remove.

In some detergents, specific enzymes are added to catalytically react with, and degrade, specific food soil components.

Physically Active Ingredients

The primary physically active ingredients are the surface active compounds termed surfactants. These organic molecules have general structural characteristic where a portion of the structure is hydrophilic (water-loving) and a portion is hydrophobic (not reactive with water). Such molecules function in detergents by promoting the physical cleaning actions through emulsifi-

Comment [57]: Plagiarized from *Basic Elements of Equipment Cleaning and Sanitizing in Food Processing and Handling Operations* by Ronald H. Schmidt, for the University of Florida IFAS Extension.

cation, penetration, spreading, foaming, and wetting. The classes of surfactants are:

- Ionic surfactants which are negatively charged in water solution are termed *anionic* surfactants. Conversely positively charged ionic surfactants are termed *cationic* surfactants. If the charge of the water soluble portion is dependent upon the pH of the solution it is termed an *amphoteric* surfactant. These surfactants behave as *cationic* surfactants under acid conditions, and as *anionic* surfactants under alkaline conditions. Ionic surfactants are generally characterized by their high foaming ability.
- Nonionic surfactants which do not dissociate when dissolved in water have the broadest range of properties depending upon the ratio of hydrophilic/hydrophobic balance. This balance is also affected by temperature. For example the foaming properties of nonionic detergents is affected by temperature of solution. As temperature increases the hydrophobic character and solubility decreases. At the cloud point (minimum solubility) these surfactants generally act as defoamers, while below the cloud point they are varied in their foaming properties.

It is a common practice to blend surfactant ingredients to optimize their properties. However because of precipitation problems, *cationic* and *anionic* surfactants cannot be blended.

Chemically Active Ingredients

Alkaline Builders

Highly Alkaline Detergents (or heavy-duty detergents) use caustic soda (sodium hydroxide) or caustic potash (potassium hydroxide). An important property of these highly alkaline detergents is that they saponify fats, forming soap.

Moderately Alkaline Detergents include sodium, potassium, or ammonium salts of phosphates, silicates, or carbonates. Tri-sodium phosphate (TSP) is one of the oldest and most effective. Silicates are most often used as a corrosion inhibitor. Because of interaction with calcium and magnesium and film formation, carbonate-based detergents are of only limited use.

Acid Builders

Acid Detergents include organic and inorganic acids. The most common inorganic acids used include phosphoric, nitric, sulfamic, sodium acid sulfate, and hydrochloric. Organic acids such as hydroxyacetic, citric, and gluconic, are also in use. Acid detergents are often used in a two-step sequential cleaning regime with alkaline detergents.

Water Conditioners

Water conditioners are used to prevent the build-up of various mineral deposits (water hardness, etc.). These chemicals are usually sequestering agents or chelating agents. Sequestering agents form soluble complexes with calcium and magnesium. Examples are sodium tripolyphosphate, tetra-potassium pyrophosphate, organo-phosphates, and polyelectrolytes. Chelating agents include sodium gluconate and ethylene diamine tetracetic acid (EDTA).

Oxidizing Agents

Comment [58]: Plagiarized from *Basic Elements of Equipment Cleaning and Sanitizing in Food Processing and Handling Operations* by Ronald H. Schmidt, for the University of Florida IFAS Extension.

Oxidizing agents used in detergent application are hypochlorite (also a sanitizer) and -- to a lesser extent -- perborate. Chlorinated detergents are most often used to clean protein residues.

Enzyme Ingredients

Enzyme-based detergents, which are amended with enzymes such as amylases and other carbohydrate-degrading enzymes, proteases, and lipases, are finding acceptance in specialized cleaning applications. The primary advantages of enzyme detergents are that they are more environmentally friendly and often require less energy input (less hot water in cleaning). Enzymes are especially effective when cleaning blood, tissue and fats from surfaces. Enzymes in these formulations also attack proteins that make up a large portion of common soil. Enzymatic cleaners are not disinfectants, and proteinaceous enzymes can be inactivated by germicides. As with all chemicals, enzymes must be rinsed from surfaces before disinfectants are applied. Use care in spraying enzyme detergents as inhaling significant amounts of enzymes can result in asthma or other allergic effects in some persons.

Fillers Fillers add bulk or mass or dilute dangerous detergent formulations which are difficult to handle. Strong alkalis are often diluted with fillers for ease and safety of handling. Water is used in liquid formulations as a filler. Sodium chloride or sodium sulfate are often fillers in powdered detergent formulations.

Miscellaneous Ingredients

Additional ingredients added to detergents may include: corrosion inhibitors, glycol ethers, and butylcellosolve (improve oil, grease, and carbon removal).

There are a wide variety of cleaning chemicals on the market today. The trend however is to select cleaners that are less damaging to the environment, and safer for those who use or work around these chemicals. The "Green" initiative is encouraging manufacturers to develop effective cleaning agents that have lower volatile organic compounds, are safer to dispose of, and are equally as effective as traditional cleaning agents. The use of enzymes, citrus oils and herbals not only perform well, but have a pleasant fragrance.

Cleaner/disinfectant combinations offer the added benefit of beginning the disinfection process while still cleaning.

Selecting the right cleaner should be based on the target soils you expect to encounter, and the compatibility with the surfaces you intend to clean. Always read the label.

Comment [59]: Plagiarized from *Basic Elements of Equipment Cleaning and Sanitizing in Food Processing and Handling Operations* by Ronald H. Schmidt for the University of Florida IFAS Extension.

Comment [60]: Plagiarized from *Guideline for Disinfection and Sterilization in Healthcare Facilities*, 2008, from the CDC.

Comment [61]: Plagiarized from *Guideline for Disinfection and Sterilization in Healthcare Facilities*, 2008, from the CDC.

Comment [62]: Plagiarized from *Basic Elements of Equipment Cleaning and Sanitizing in Food Processing and Handling Operations* by Ronald H. Schmidt for the University of Florida IFAS Extension.

There are a number of new and innovative products that have captured the attention of forward-thinking cleaning and disinfection industry leaders in the past couple of years. These devices not only expedite the cleaning process, but also have increased the level of cleanliness of surfaces by factors of tens if not hundreds. The following products are presented as suggestions, and their technology, not the manufacturer, is being promoted here for your education. There are many fine companies with similar products, which due to the space considerations of this book, cannot all be presented.

Mopping: Common string mops have been accused of harboring contaminants and transferring them to every surface they are used on. Studies have shown that when using a detergent solution the mop water becomes increasingly dirty and contaminated when a mop is re-dipped into the same water after each mopping. In order to improve the efficiency and reduce cross-contamination of floor surfaces, a two-reservoir bucket should be used to rinse the mop before re-dipping into the detergent solution. To further reduce cross-contamination, utilize a detergent combined with a disinfectant (disinfectant-cleanser). The disinfectant helps to minimize the microbial contamination of the water. Microfiber mops have demonstrated superior microbial removal compared with conventional string mops when used with a detergent cleaner (94% vs 68%). Microfibers are densely constructed polyester and polyamide (nylon) fibers that are approximately 1/16th the thickness of a human hair. The positively charged microfibers attract dust (which has a negative charge) and are more absorbent than a conventional cotton-loop mop. Microfiber materials also can be wet with disinfectants, such as quaternary ammonium compounds (which are deactivated by the cotton in string mops).



Comment [63]: Plagiarized from *Guideline for Disinfection and Sterilization in Healthcare Facilities*, 2008, from the CDC.



Comment [64]: Plagiarized from <http://www.ncbi.nlm.nih.gov/pubmed/17980233>

Comment [65]: Plagiarized from *Guideline for Disinfection and Sterilization in Healthcare Facilities*, 2008, from the CDC.

High-Flow Fluid Extraction (HFFE):

Also known as "no-touch" cleaning systems, these devices are basically a variable pressure sprayer, and a HEPA-filtered wet vacuum which can be used with a variety of chemicals or just clean water. HFFE process offers a number of advantages over mop cleaning systems.

The HFFE cleaning process includes built-in dwell time which is very important for the loosening and lifting of soils from the cleaning surface. Typically this dwell time is minimized during mopping due to the fact that the liquid application and the soil entanglement occur simultaneously.

The high flow extraction of soils and liquid through the system's built-in wet vacuum ensures that contaminants are removed from the floor, including the vulnerable grout lines, where the other cleaning methods fail to agitate, absorb, or lift soils. Also, minimal liquid is left after cleaning, which inhibits post-cleaning bacterial growth. Mopping processes leave behind a substantial residue of moisture, soil, water deposits and cleaning compounds along with an increased dry time.



Comment [66]: Plagiarized from <http://www.kaivac.com/documents/CIRIResearchPaper.pdf>, written in 2006.

Comment [67]: This photo is from kaivac.com.



Squeegees vs. Wipes:

Using a reusable cloth poses the same cross-contamination problems of a string mop. Even microfiber cloths, although they are more efficient than cloth wipes, contribute to cross contamination if they are used on more than one item or location. A recent study sponsored by Kaivac revealed the benefits of combining an agitation method with a squeegee to achieve remarkable results. They used student desks from a school to conduct the study. The first test was to clean the desks in a classroom with microfiber in conjunction with a hospital grade disinfectant cleaner. Each desktop was sprayed with the cleaning solution and then wiped clean in a circular motion with the microfiber towel. A new microfiber towel was used for the test. The chart on the next page shows the before and after ATP measurements.

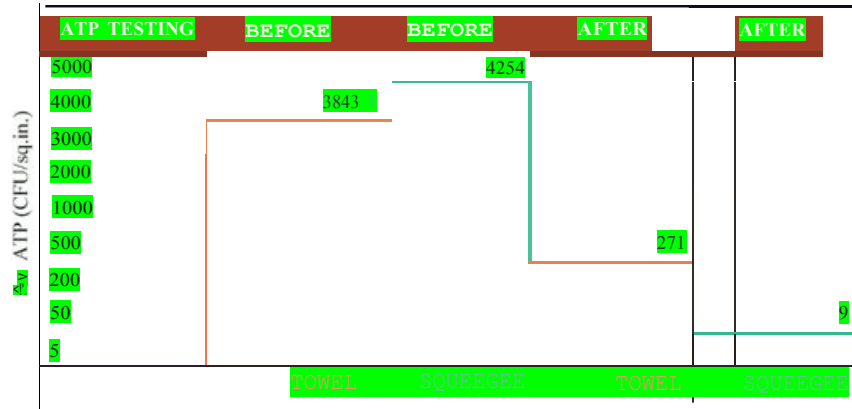
These results surprised them because

the desktops did not get much cleaner than the initial readings of restroom toilets and floors.

They started off with a new clean microfiber towel, however, it quickly loaded up with soil. In fact, by the end of the study, some desktops were actually dirtier after cleaning.

The Kaivac team then evaluated a cleaning process that combined a microfiber applicator pad with a hand-held squeegee. Then, they compared the results of this new squeegee-based method with the original microfiber towel method. After cleaning, it was difficult to visually discern a difference between the two methods. However, ATP and bacteria (CFU – colony forming units) measurements revealed the following results:

Comparison of Desktop Cleaning Methods



The charts on the top show average ATP readings before and after cleaning. The charts on the bottom are average bacteria counts before and after (as determined by 3M Quick Swab – Aerobic Bacteria Petrifilm Plates).

The desktops were soiled consistently with a test solution that was both high in ATP and bacteria. The charts on the left show the "before cleaning" measurements.

Why were the results so different when the visual appearance was similar? The key is highly

efficient soil removal capabilities that are effective even at a microscopic level. Clearly, adding the squeegee to the process improved the cleaning effectiveness dramatically. The microfiber rag alone left 30 times more ATP and 154 times more bacteria behind. This represents a quantum leap of improvement.

The squeegee was the key to soil removal on these flat surfaces. That's why squeegees work well for cleaning windows, where soil shows up so clearly. Interestingly, adding the squeegee to the process did not add any time to the process. In fact, it was actually faster and it also reduced shoulder fatigue.

Without scientific measurement, this would never have been discovered. Many would have erroneously assumed that the processes achieved similar results and inadvertently left invisible disease-causing organisms behind.

Low Vapor Steam:

Using tap water, this multi-purpose system creates a low moisture vapor that carries heat to the surface you wish to treat. The heat combined with light agitation does the work for you. This device comes with a variety of accessories creating a system that can be used in an unlimited number of applications. The system can be used for carpets as well as hard surfaces. The process eliminates chemical residues while sanitizing the surface being treated. Because so little water is consumed, it's virtually "mess free".

The unit produces a high temperature, low moisture vapor. The vapor contains only 5% to 6% water and is much less dense than the air we breathe. The vapor system produces thousands of gallons of live dry steam using only about 1.5 quarts of water per hour. This relates directly to the versatility and capabilities of temperatures hot enough to kill bacteria and germs, emulsify grease and oil as well as other surface contaminants. The system is also quiet and portable so it can be used anywhere at anytime.



The system produces only low pressures, usually in the range of 50 to 60 PSI. The low pressure creates a very safe, and easy to use system. Low pressures are also essential for getting the job done without making a huge mess. The work is done by the heat concentrated at the work surface. The heat dissipates quickly once the vapor

Comment [68]: Plagiarized from <http://www.issa.com/?m=articles&event=view&id=3486&page=2&category=131>, written by Tom Morrison, Kaivac, Inc.

expands into the atmosphere. Many of these systems are being used in hospitals, retirement care facilities, the food service industry, hospitality industry, and government institutions such as schools and universities. The use of this system improves indoor air quality, reduces the physical effort involved with cleaning and provides a more thorough approach to cleaning. Because the use of chemicals is reduced and because water does not involve the regulatory requirements that many cleaning chemicals require, liability is lessened.



Comment [69]: This is boilerplate information available on many low vapor steam manufacturer websites; for example, <http://www.sylvane.com/learning-center/steam-cleaner-faq.html#steamvapor>, <http://www.toxicfreecleaning.com/#!/dry-steam-vapor/c32y>, <http://www.vaportechnologies.com/FAQ.html>,

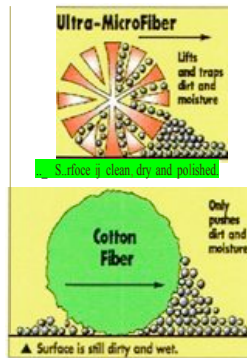
Electrostatic Sprayer



ElectroStatic Sprayers are similar to other sprayers with one important modification. These sprayers have an electrically powered element at the nozzle that places an electro-static charge to any fluid sprayed through it. The charge causes the sprayed mist to act like a magnet, and is pulled to any surface where it coats the surface evenly, even into cracks and crevices where most sprays don't go. It also wraps around and covers the underneath of items, creating an efficient and thorough treatment.

Microfiber Cloths:

The major difference between microfiber and cotton cloths is that microfibers are made up of strands of polyester and polyamide or nylon bundled together to form strands so small the human eye can barely see them. (at least one-sixteenth the size of a human hair) When examined under a microscope the bundles appear in the shape of a star. Those bundles are then split into ultra-fine single fibers using a specific combination of chemicals, heat and agitation. The fibers are finally woven together to make the finished microfiber product.



Research shows that it is the amount of splits that determines the quality of the microfiber. When woven together these strands create a surface area covered with millions of spaces between the fibers to trap moisture, dirt and debris. The strands curled ends will also reach into cracks and crevices, picking up and removing dirt, holding it inside the pad. It is reported that fibers rubbing together also produce a static charge that attracts the dirt, pulling it in and trapping it until the cloth or pads are washed, at which time the charge is broken and the dirt is released.

Microfiber cloths and mitts have been developed for smaller surfaces such as counters, windows and mirrors. Also, some manufacturers have come out with wands that use microfiber products for harder-to-reach surfaces.

Because microfiber is so versatile, some manufacturers have expanded their product line to include microfiber scrubbers, general purpose, soft cloths, etc., to target specific tasks. Users should be aware of the variety of microfiber products on the market and understand that not all can be used for every application. For example, if a scrubbing cloth were used on a plastic finish, the cloth may scratch the surface. A soft cloth should be used in this situation. Manufacturer guidelines will help users identify and avoid these trouble areas.



- The life expectancy of a microfiber product will depend on a number of factors. The first is the quality of microfiber composition that is used. The care that is given to the cleaning and storage of the product will also affect its life span. If cared for properly, microfiber can be laundered anywhere from 100 to 500 times.

When using microfiber there are very few applications that require the use of chemicals. Studies show that because of its technology, microfiber will clean more effectively when used dry than traditional products do when using chemicals. In situations where chemicals are required, manufacturers have come up with a few recommendations for combining the two.

Dampen the pad or cloth before using it, but do not 'wet' it. If too much water or chemical is used, the crevices that are designed to attract and hold dirt will fill with liquid.

Watch for warning labels. If the chemical indicates that it will harm plastics, it will most likely harm microfiber.

Regardless of the use of chemicals, the laundering of microfiber products will also impact its life span.

The initial cost of microfiber products may be higher, but manufacturers guarantee significant savings over time.

Comment [70]: Plagiarized from <http://www.cleanlink.com/hs/article/Understanding-Microfiber-Technology--3970>, posted 2-1-2006, and written by Corinne Streit.

DISPOSABLE TOWELS

Although there are many advantages of using microfiber over conventional cloth towels or rags, the only true way to eliminate cross contamination is to use a new rag for each new surface you clean. An efficient way to accomplish this is with disposable towels. Most paper towels sold for home use are not strong enough or absorbent enough for commercial use. The towel rolls also present the problem of exposure to the surface they are sitting on, and often fall over and roll away or onto a contaminated surface. A better solution is a paper towel product packaged in a



box similar to a large (1 cubic foot) facial tissue box. These are marketed by Kimberly-Clark under the Scott brand name, and by Sellars Co.

Using these disposable pop-up towels in a box keeps them clean and secure until ready to use. Simply use once and throw away, completely eliminating the potential for cross-contamination.

INITIATING A CLEANING PROCESS

Once you have observed the area to be cleaned, a plan should be developed to clean the area in an organized manner. A plan will help assure that no item, portion, or surface gets overlooked.

Generally speaking, cleaning should begin at the highest points of the area and work downward. In some situations, this may be just the highest "touchable" surfaces. Working in this manner will prevent contaminated liquids from dripping onto lower, already cleaned surfaces.

Application of the cleaning chemical can be accomplished with wetting a towel, using a trigger spray bottle, a pressure sprayer or some other application device. Work in small sections by imagining a 1' to 2' square. Apply the cleaner to the defined area and allow enough dwell time (see label) for it to work.



Agitate the surface using a brush, scrubbie, or microfiber towel, then wipe the surface with a disposable paper towel or squeegee.




Rinse the surface by spraying with clean, potable water, then wipe dry using a disposable paper towel or squeegee.



For hard to reach nooks and crannies, or for surfaces that are not heat sensitive, consider the use of a low vapor-steam device. Spray the surface with the cleaning chemical (unless chemical use is contraindicated), allow proper dwell time, then apply steam. For nooks and crannies, use the nozzle to direct the steam into small spaces to dislodge foreign material and sanitize. For flat surfaces, attach a towel to the brush head and move the head across the target surface to clean and remove the surface and sub-surface dirt. Change the towel often.



For walls, bathroom fixtures, and floors, consider the use of a no-touch cleaning system.

 **IMPORTANT NOTE:**
There are over a thousand synthetic detergents available in the United States. Detergent molecular structures consist of a long hydrocarbon chain and a water soluble ionic group. Most detergents have this negative ionic group and are called anionic detergents. Anionic detergents (including soap and the largest portion of modern synthetic detergents), which produce electrically negative colloidal ions in solution, react with Quaternary Ammonium Compound (Quat) disinfectants and render the disinfectant useless. Therefore, know the detergent you are using, the disinfectant you are using, and always rinse all surfaces cleaned with soap or detergents prior to applying a disinfectant.

Comment [71]: Verbatim except for Berg changing one word. Plagiarized from the Virtual Chembook, Elmhurst College.

<http://www.elmhurst.edu/~chm/vchembook/558detergent.html>

 **VIRTUAL CHEMBOOK**
Elmhurst College
Charles E. Ophardt, c. 2003

Comment [72]: Plagiarized from <http://www.britannica.com/EBchecked/topic/550751/soap-and-detergent>,

CHAPTER
6
Quantifying
Cleanliness

DECONTAMINATION

Traditional Methods

Traditional methods for cleanliness testing include visual inspection and the aerobic plate count. While visual inspection is inherently subjective, qualitative, and limited to the detection of only visible contamination, it does offer the advantage of instant "real time" inspection. For quantitative detection, most quality assurance programs rely on 100 year old methodology, the traditional agar-based aerobic plate count. The aerobic plate count is a time consuming process requiring a level of skill to prepare plates, take samples, and read results. Aerobic plate counts take at least two days to complete. Unfortunately the test cannot detect the presence of organic residues, do not produce timely results, and can only detect a limited range of micro-organisms.

Bioluminescent ATP assay

The significant limitations of traditional methods, the heightened concern regarding biological safety, and the need for better and more timely cleanliness testing have caused usage of ATP bioluminescence testing systems to increase significantly in recent years. Although ATP bioluminescence technology has been commercially available since the 1970's, only recently have advances in portable instrumentation and time-stable reagent chemistry been achieved. With these advances, ATP bioluminescence has gained widespread acceptance as providing significant benefits over traditional methods of cleanliness testing.

ATP (adenosine tri-phosphate) is the chemical compound in which energy is stored in all living cells. ATP can be found in the biological residue found on most surfaces. When the surface is wiped with a swab, the cells and their ATP is transferred to the Luminometer for testing. In the ATP-luminometric test, the firefly enzyme (luciferase) is used to convert the chemical energy of ATP into light through an oxidation-reducing reaction. The quantity of light generated is directly proportional to the amount of ATP present, thus, the luminometer can measure the light units to estimate the biomass of cells in a sample. With state of the art equipment, and highly purified reagents, it is possible to detect amounts of ATP corresponding to approximately 100 bacterial cells, although in practice it is usually nearer to 10³-10⁴. The procedure can be easily performed by almost anyone with little training. The user swabs the surface to be tested, activates the swab by placing it into the solution of reagents, then inserts it into the chamber of the luminometer to obtain the measurement. The entire test typically takes less than a minute to complete.

Comment [73]: Plagiarized from: http://www.hygiena.net/tech_library-article-02a.html. © copyright 2005 hygiena, llc

Comment [74]: Plagiarized from: http://www.hygiena.net/!-esp/tech_library-01a.html © copyright 2005 hygiena, llc

Comment [75]: Plagiarized from: http://www.hygiena.net/!-esp/tech_library-01a.html © copyright 2005 hygiena, llc

The greatest benefit of this device is that it allows immediate measurement of biological residue, both microbial and plant/animal residue, to identify contaminated surfaces that have not been properly cleaned.

This ATP method is currently gaining popularity in evaluating microbial loads in many industries, including food processing plants, schools, restaurants and hospitals.

All disinfection providers should incorporate ATP luminescence in their evaluation and documentation of cleaning/disinfecting success.



Machinery used in the packaging of food-grade ice cubes. After cleaning the luminometer read "0".

CHAPTER
7
Antimicrobials

ANTIMICROBIAL FACTS

Antimicrobial pesticides are substances or mixtures of substances used to destroy or suppress the growth of harmful microorganisms whether bacteria, viruses, or fungi on inanimate objects and surfaces. Antimicrobial products contain about 275 different active ingredients and are marketed in several formulations: sprays, liquids, concentrated powders, and gases.

Today, approximately one billion dollars each year are spent on a variety of different types of antimicrobial products. More than 5000 antimicrobial products are currently registered with the U.S. Environmental Protection Agency (EPA) and sold in the marketplace. Nearly 60% of antimicrobial products are registered to control infectious microorganisms in hospitals and other health care environments.

Product labels provide critical information about how to safely and legally handle and use antimicrobial products. Unlike most other types of product labels, these labels are legally enforceable, and all of them carry the statement: "It is a violation of Federal law to use this product in a manner inconsistent with its labeling." In other words, the label is the law.



Comment [76]: Plagiarized from <http://www.epa.gov/pesticides/factsheets/antimic.htm>

Comment [77]: Berg merely eliminated the word "pesticide" at the beginning of the paragraph from the EPA. Plagiarized from <http://www.epa.gov/oppfead1/labeling/lrm/label-review-manual.pdf>

Comment [78]: Berg is violating Federal law by using the EPA logo. "...the EPA logo cannot be released for any commercial purposes and the written policy (EPA Order 1015.2a) "prohibits reproduction and/or use of the symbol for commercial purposes." This information has been quoted from: <http://www2.epa.gov/aboutepa/epa-seal>

INTRODUCTION TO ANTIMICROBIALS

Cleaning and disinfection are tools used to impede the spread of pathogenic microorganisms. The appropriate use of cleaning agents and disinfectants is especially critical with today's issue of resistant microbes ("super-bugs"). At the correct strength, disinfectants kill bacteria and other microbes. However, if lower levels are used, the bacteria can survive and become resistant to treatment according to a paper published in the October 2009 issue of the journal *Microbiology*. For instance, using disinfectants improperly, using disinfectants that are not strong enough, or improper pre-cleaning can allow the potentially lethal bacterium *Staphylococcus aureus* to be able to remove the disinfectant's toxic chemicals from its cell, potentially making it resistant to being killed.

The individual entrusted with cleaning and disinfecting activities should cultivate a broad knowledge of the products, including their proper use and efficacy.

The Prerequisite for Effective Disinfection

As we have seen in a previous chapter, disinfection begins with an effective cleaning program. Organic deposits not only harbor bacteria but may actually prevent the disinfectant from coming into physical contact with the surface that needs to be disinfected. In addition, the presence of organic deposits may actually inactivate or reduce the effectiveness of some types of disinfectants, rendering the procedure ineffective. Large soils and residues are initially removed by scraping or other mechanical means. The detergent appropriate for the soil being removed is then applied, allowed to dwell, scrubbed, and rinsed with clean water to flush away residual soil and detergent. Once this process has taken place and the surface is visually clean, the disinfectant can be applied for the appropriate dwell (contact) time. With most disinfectant applications, a further rinse with potable water is not required nor is it recommended, since there is a high probability that in doing so, might result in recontamination of the surface with micro-organisms present in the rinse water.

UNDERSTANDING DISINFECTANTS

The proper selection and use of disinfectants is essential for safety and quality control. Disinfectants have "use" parameters and various characteristics that must be considered before one is selected for a particular use. Just because the advertisement for a disinfectant makes it sound effective, you must research its capabilities and EPA registration to make sure it is

Comment [79]: Plagiarized from http://www.dem.ri.gov/topics/erp/nahems_cleaning_and_disinfection.pdf (2003)

Comment [80]: Plagiarized from <http://www.animal.ufl.edu/extension/meat/HACCP/choosing%5B1%5D.html>, written by Nathan Schiff, Ph D, for the University of Florida. (copyright 1998)

Comment [81]: Plagiarized from <http://www.infectioncontrolday.com/articles/2002/02/infection-control-today-02-2002-matching-the-right.aspx>, written by Michelle Gardner.

something that will work in your specific environment and against the specific pathogens you want to kill.

It is safe to say that the use of broad-spectrum antimicrobials helps to ensure that you kill pathogens that are present that you did not know were present. But what if you have specific problem pathogens that are either confirmed to be present or have the potential to be present? In those cases, you must be sure that you have the right antimicrobial on hand, and that you apply it in a way that is proper and effective.

As we can see in the table below, the EPA categorizes antimicrobials based on their ability to kill some very specific "marker" pathogens. Many of these pathogens can be related to the industry and the types of scenes we deal with. Visit www.epa.gov/oppad001/chemregindex.htm to access the following lists:

- List A: EPA's Registered Antimicrobial Products as Sterilizers
- List B: EPA Registered Tuberculocide Products Effective Against *Mycobacterium tuberculosis*
- List C: EPA's Registered Antimicrobial Products Effective Against Human HIV-1 Virus
- List D: EPA's Registered Antimicrobial Products Effective Against Human HIV-1 and Hepatitis B virus
- List E: EPA's Registered Antimicrobial Products Effective Against *Mycobacterium tuberculosis*, Human HIV-1 and Hepatitis B Virus
- List F: EPA's Registered Antimicrobial Products Effective Against Hepatitis C Virus
- List G: EPA's Registered Antimicrobial Products Effective Against *Methicillin Resistant Staphylococcus aureus* (MRSA) and Vancomycin Resistant *Enterococcus faecalis*

Basic Definitions

The terminology often associated with germicidal activity can be confusing or misleading and in many cases there is an overlap in function. Often, the concentration of the product defines what classification it falls under.

- **SANITIZER:** Used to reduce, but not necessarily eliminate, microorganisms from the inanimate environment to levels considered safe as determined by public health codes or regulations. Sanitizers include:
 - food contact products - These products are important because they are used on sites where consumable food products are placed and stored. Sanitizing is for surfaces such as:
 - dishes and cooking utensils
 - equipment and utensils found in:
 - dairies
 - food-processing plants
 - eating and drinking establishments

Comment [82]: Plagiarized from <http://www.animal.ufl.edu/extension/meat/HACCP/choosing%5B1%5D.htm>, written by Nathan Schiff, Ph D, for the University of Florida. (copyright 1998)

- **non-food contact products** - Non-food contact surface sanitizers include:
 - carpet sanitizers
 - air sanitizers
 - laundry additives
 - in-tank toilet bowl sanitizers

In general, to sanitize means to reduce the number of microorganisms to a safe level. The official and legal version states that a sanitizer must be capable of killing 99.9% known as a 3 log reduction, of a specific bacterial test population (Staphylococcus aureus ATCC 6538 and Klebsiella pneumoniae, aberrant, ATCC 4352. Enterobacter aerogenes (ATCC 13048 or 15038) may be substituted for K. pneumoniae), and to do so within 5 minutes. A sanitizer may or may not necessarily destroy pathogenic or disease causing bacteria as is a criteria for a disinfectant. On food contact surfaces a sanitizer must reduce target organisms (E. coli and S. aureus) by 99.999% (5-log) in 30 seconds

- **DISINFECTANT:** Used on hard inanimate surfaces and objects to destroy or irreversibly inactivate infectious fungi and bacteria but not necessarily their spores. Disinfectant products are divided into two major types:
 - hospital type disinfectants
 - general use disinfectants



A disinfectant is a chemical agent which is capable of destroying disease causing bacteria or pathogens, but not spores and not all viruses. From a technical and legal sense, a disinfectant must be capable of reducing the level of specific pathogenic bacteria by 99.999% during a time frame of less than 10 minutes

The main difference between a sanitizer and a disinfectant is that at a specified use dilution, the disinfectant must have a higher kill capability for pathogenic bacteria compared to that of a sanitizer.

- **STERILANT:** Sterilizers (Sporicides): Used to destroy or eliminate all forms of microbial life including
 - fungi
 - viruses
 - all forms of bacteria and their spores

Comment [83]: Plagiarized from <http://www.epa.gov/pesticides/factsheets/antimic.htm>

Comment [84]: Plagiarized from <http://www.animal.ufl.edu/extension/meat/HACCP/choosing%5B1%5D.html>, written by Nathan Schiff, Ph D, for the University of Florida. (copyright 1998)

Comment [85]: Plagiarized from http://www.epa.gov/oppad001/dis_tss_docs/dis-10.htm

Comment [86]: Plagiarized from <http://www.animal.ufl.edu/extension/meat/HACCP/choosing%5B1%5D.html>, written by Nathan Schiff, Ph D, for the University of Florida. (copyright 1998)

Comment [87]: Plagiarized from <http://www.epa.gov/pesticides/factsheets/antimic.htm>

Comment [88]: Plagiarized from <http://www.animal.ufl.edu/extension/meat/HACCP/choosing%5B1%5D.html>, written by Nathan Schiff, Ph D, for the University of Florida. (copyright 1998)

Spores are considered to be the most difficult form of microorganism to destroy. Therefore, EPA considers the term Sporicide to be synonymous with "Sterilizer." Sterilization is critical to infection control and is widely used in hospitals on medical and surgical instruments and equipment. Types of sterilizers include

- steam under pressure (autoclaving)
- dry heat ovens (used primarily for sterilization of medical instruments)
- low temperature gas (ethylene oxide) (used primarily for sterilization of medical instruments)
- liquid chemical sterilants (used primarily for delicate instruments which cannot withstand high temperature and gases)

Sterilants are specialized chemicals, such as glutaraldehyde or formaldehyde, which are capable of eliminating all forms of microbial life, including spores. The term sterilant conveys an absolute meaning; a substance can not be partially sterile.

Comment [89]: Plagiarized from <http://www.epa.gov/pesticides/factsheets/antimic.htm>

Comment [90]: Plagiarized from <http://www.animal.ufl.edu/extension/meat/HACCP/choosing%5B1%5D.html>, written by Nathan Schiff, Ph D, for the University of Florida. (copyright 1998)

TOXICITY LABELING: The EPA also assigns toxicity labeling designations to antimicrobials that represent the level of danger these products are to our health.

- **Level 1** Signal Word "**Danger**" Precautionary Statement: Fatal if swallowed, fatal if absorbed through the skin, fatal if inhaled, corrosive: causes irreversible eye damage, corrosive; CAUSES SKIN BURNS.
- **Level II** Signal Word "**Warning**" May be fatal if swallowed, may be fatal if absorbed through the skin, may be fatal if inhaled, causes substantial but temporary eye damage, causes skin irritation.
- Signal Word " " Harmful if swallowed, harmful if absorbed through the skin, harmful if inhaled, causes moderate eye irritation, avoid contact with skin or clothing.
- **Level IV** Signal Word None required.

In a survey recently taken across the U.S., we found a few products being used under the assumption that because the manufacturer's advertising said they were effective against hundreds of bacteria and viruses, technicians mistakenly believed that they would work on EVERY PATHOGEN. Those types of assumptions can often be wrong.

And finally, it is important to note that even disinfectants can become "infected" with bacterial pathogens. With the exception of high-level disinfectants, some of the most commonly used products have experienced some level of contamination from touching the mouth of the container with contaminated hands/gloves, or when diluting the product with water that has itself become contaminated. The most frequent offender is the bacterium *Pseudomonas*, probably because of its versatility in utilizing a variety of nutritional sources and the ability

of their outer membrane to prevent the passage of germicides into the bacterium. Germicides used as disinfectants that were reported to have been contaminated include chlorhexidine quaternary ammonium compounds, phenolics, and pine oil.

Comment [91]: Plagiarized from http://www.cdc.gov/hicpac/disinfection_sterilization/3_4surfaceinfection.html

FACTORS AFFECTING THE EFFICACY OF DISINFECTANTS

There are a number of factors that can alter the efficacy of disinfectants. Knowing what these are can help the technician make adjustments to the treatment process in order to produce the desired result. Primarily, this directly relates to the product "DWELL TIME". Dwell time, also known as wet time or contact time, is the amount of time the target organisms have to be in direct contact with the disinfectant. With most disinfectants, this means a continuous wetting of the surface for the required time period listed on the product label (at a minimum). The product must not be allowed to dry before the allotted time has been reached. Dwell time is listed on the product label and is calculated by tests conducted on non-porous, horizontal surfaces at approximately 70F and normal indoor humidity. The target organisms used are not permitted to colonize the surface or permitted to produce a biofilm prior to testing. However, in real life conditions, these environmental factors are rarely found. Therefore, we must assess the environment we are about to treat to decide whether increasing the dwell time is indicated. Since no scientific testing has established how much longer, it may be prudent to at least double dwell times whenever we feel the following individual factors may interfere with the disinfectant's ability to kill all pathogens present within the time frame stated on the label.

Resistance of the Microbes

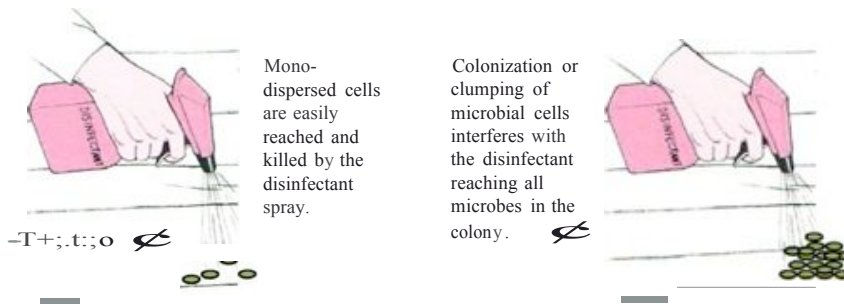
Microorganisms vary a great deal in their ability to resist the effects of disinfectants. Bacterial spores are resistant to disinfectants because the spore coating and its cortex act as a physical barrier. Mycobacteria for instance, have a waxy cell wall to prevent entry, while gram-negative bacteria have an outer membrane to prevent infiltration by disinfectants. You must understand that when applying a disinfectant the dwell time is dictated by the most resistant microbes in the target area.

Comment [92]: Plagiarized from http://www.cdc.gov/hicpac/pdf/guidelines/disinfection_nov_2008.pdf

Location and Number of Microorganisms

Even if all other factors remained the same, the more microbes there are on a surface, the longer it will take for the disinfectant to kill all of them. Cleaning a surface prior to disinfecting helps to reduce these numbers by physically removing them from the surface.

Comment [93]: Plagiarized from http://www.cdc.gov/hicpac/pdf/guidelines/disinfection_nov_2008.pdf. (Original text reads: "Number and Location of Microorganisms All other conditions remaining constant, the larger the number of microbes, the more time a germicide needs to destroy all of them.")



Potency and Concentration of Disinfectants

All disinfectants are not created equal, nor do they kill by the same methods. The length of disinfection dwell time depends on the potency of the disinfectant. This was illustrated by Spaulding who demonstrated using the mucin-loop test that 70% isopropyl alcohol destroyed 99.99% of *M. tuberculosis* in 5 minutes, whereas a simultaneous test with 3% phenolic required 2-3 hours to achieve the same level of microbial kill.

Inorganic and Organic matter

Inorganic matter provides a protective barrier or shield that microbes can hide under. Inorganic matter can also absorb the disinfectant, depleting the amount of available disinfectant necessary to effect a kill. Organic matter such as blood, body fluids, feces or other tissue can also interfere with the antimicrobial activity of disinfectants. First, the organic matter reacts with the disinfectant creating a chemical reaction that lessens its potency and availability. Second it provides a protective physical barrier.

Environmental Factors

Many physical and chemical factors also influence the disinfectant procedure: **Temperature:** The activity of most disinfectants increases as the temperature increases. Too great an increase in temperature, however, causes the disinfectant to degrade and weakens its germicidal activity. Conversely, decreases in temperature decrease the activity of many disinfectants. For Hypochlorites (bleach), every 0°C (18°F) drop in temperature requires a doubling of the dwell time. **Water Hardness:** Reduces the rate of kill of certain disinfectants because divalent cations (e.g., magnesium, calcium) in the hard water interact with the disinfectant to form insoluble precipitates. **pH:** An increase in pH improves the antimicrobial activity of some disinfectants (e.g., glutaraldehyde, quaternary ammonium compounds) but decreases the antimicrobial activity of others (e.g., phenols, hypochlorites and iodine). The pH influences the antimicrobial activity by altering the disinfectant molecule or the cell surface.

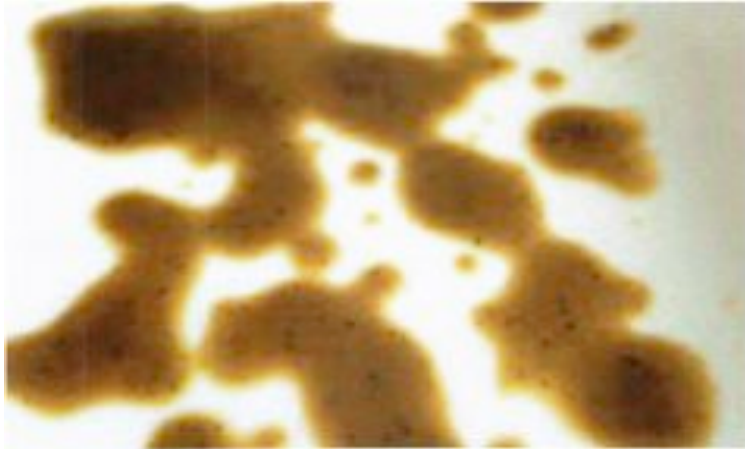
Comment [94]: Plagiarized from http://www.cdc.gov/hicpac/pdf/guidelines/disinfection_nov_2008.pdf

Comment [95]: Plagiarized from http://www.cdc.gov/hicpac/pdf/guidelines/disinfection_nov_2008.pdf

Relative Humidity: Low humidity may cause the disinfectant to evaporate from the surface before the proper dwell time has elapsed.

Biofilms

Biofilms are microbial communities that are tightly attached to surfaces and cannot be easily removed. They are protected from most disinfectants by the production of a thick mass of cells and slime. Bacteria within biofilms are up to 1,000 times more resistant to antimicrobials than are the same bacteria in suspension. (See page 11 for further information on biofilms).



Comment [96]: Plagiarized from the Physical and Chemical Factors section in http://www.cdc.gov/hicpac/pdf/guidelines/disinfection_nov_2008.pdf

Comment [97]: Again, plagiarized from http://www.cdc.gov/hicpac/pdf/guidelines/disinfection_nov_2008.pdf

Antimicrobials by Chemical Composition

Alcohol:

Alcohol, usually ethanol or isopropanol, are sometimes used as a disinfectant, but more often as an antiseptic (the distinction being that alcohol tends to be used on living tissue rather than nonliving surfaces). They are non-corrosive, but can be a fire hazard. They also have limited residual activity due to evaporation, which results in brief contact times unless the surface is submerged, and have a limited activity in the presence of organic material. Alcohols are most effective when combined with purified water to facilitate diffusion through the cell membrane; 100% alcohol typically denatures only external membrane proteins. A mixture of 70% ethanol or isopropanol diluted in water is effective against a wide spectrum of bacteria, though higher concentrations are often needed to disinfect wet surfaces. Additionally, high-concentration mixtures (such as 80% ethanol + 5% isopropanol) are required to effectively inactivate lipid-enveloped viruses (such as *HIV*, *hepatitis B*, and *hepatitis C*). Alcohol is, at best, only partly effective against most non-enveloped viruses (such as hepatitis A), and is not effective against fungal and bacterial spores. The efficacy of alcohol is enhanced when in solution with the wetting agent dodecanoic acid (coconut soap). The synergistic effect of 29.4% ethanol with dodecanoic acid is effective against a broad spectrum of bacteria, fungi, and viruses. Further testing is being performed against *Clostridium difficile* (C.Diff) spores with higher concentrations of ethanol and dodecanoic acid, which proved effective with a contact time of ten minutes.

Intermediate Level Disinfectant

- ✓ Kills by denaturing proteins. ✓
- ✓ Need 60-90% for optimum effectiveness.
- ✓ May not penetrate organic material.
- ✓ Ethyl or isopropyl alcohol.
- ✓ Evaporation rate hinders ability to maintain a wet contact of at least five minutes to achieve a reasonable level of disinfection.
- ✓ Rapidly bactericidal against vegetative form of bacteria (gram+ and gram-)
- ✓ Tuberculocidal, fungicidal
- ✓ Effective against enveloped viruses.
- ✓ Not effective against bacterial spores.
- ✓ Limited effectiveness against non-enveloped viruses.
- ✓ Volatile Flammable
- ✓ Can dry and irritate skin
- ✓ Fumes can be irritating
- ✓ Can damage synthetics, will stain and dry-out rubber and warp some plastic surfaces

Comment [98]: Plagiarized from <https://www.boundless.com/microbiology/culturing-microorganisms/chemical-antimicrobial-control/types-of-disinfectants/>

Comment [99]: Plagiarized from http://www.cdc.gov/hicpac/pdf/Disinfection_Sterilization/Pages38_42Disinfection_Nov_2008.pdf

Chlorine and chlorine compounds (Hypochlorites): Clorox Bleach, Dispatch

Chlorine bleach products in the U.S. are aqueous solutions of 5.25%-6.15% sodium hypochlorite, or 52,500-61,500 ppm available chlorine. A 1:10 dilution of household bleach provides about 5250-6150 ppm. They have a broad spectrum of antimicrobial activity, do not leave toxic residues, are unaffected by water hardness, are inexpensive and fast acting, remove dried or fixed organisms and biofilms from surfaces, and have a low incidence of serious toxicity. When used in a 1:10 dilution, it offers wide spectrum efficacy on *M. tuberculosis*, *Clostridium difficile* spores, *S. aureus* and *Salmonella choleraesuis* in 10 minutes.

Intermediate to High Level Disinfectant

Unaffected by water hardness.

or every 18°F drop in temperature, dwell time must be doubled

Extremely corrosive to metals in concentrations >500ppm. (1:10 is 5000ppm)

Agent of choice in disinfecting food prep surfaces at proper dilution.

Bleaches fabrics

Very caustic to tissue - oropharyngeal, esophageal.

Rapidly inactivated by organic debris (blood, tissue, saliva, feces, microbes).

Fumes can be irritating.

Diluted solutions quickly lose their effectiveness. New solutions should be mixed daily.

Broad spectrum activity - Effective against both enveloped and nonenveloped viruses, fungi, bacteria, and algae, but not spores.

** on surfaces contaminated with CJD, use 50/50 dilution, up to full strength with a 1-hour contact time.

Glutaraldehyde: Cidex, ProCide, Cetylcide, Metricide

High Level Disinfectant

Not appropriate for field use.

Long contact times up to 20 minutes

Bacteriacidal, virucidal, fungicidal, sporicidal and parasiticidal.

Can cause chemical burns on skin, cornea and mucous membranes.

Eye and Respiratory irritation

Moderate residual activity - Thorough and copious rinsing is required to prevent toxicity.

Unstable. Effective life of solution between 2 weeks to 30 days.

Requires chemical test strips to ensure effective concentration is present.

Corrosive to metals.

Comment [100]: Plagiarized from http://www.cdc.gov/hicpac/pdf/guidelines/disinfection_nov_2008.pdf

Comment [101]: Plagiarized from http://www.perfectlives.com/pdf/perfectshield/COMPARISON_DISINFECTANT_PRODUCTS.pdf

Comment [102]: Plagiarized from http://www.perfectlives.com/pdf/perfectshield/COMPARISON_DISINFECTANT_PRODUCTS.pdf

Peroxygens (Hydrogen Peroxides)

Hydrogen peroxide is used in hospitals to disinfect surfaces and it is used in solution alone or in combination with other chemicals as a high level disinfectant. Hydrogen peroxide vapor is used as a medical sterilant and as room disinfectant. Hydrogen peroxide has the advantage that it decomposes to form oxygen and water thus leaving no long term residues, but high concentrations of hydrogen peroxide as with most other strong oxidants is hazardous and solutions are a primary irritant. The vapor is hazardous to the respiratory system and eyes and consequently the OSHA permissible exposure limit is 1 ppm (29 CFR 1910.1000 Table Z-1) calculated as an eight hour time weighted average and the NIOSH immediately dangerous to life and health limit is 75 ppm. Therefore, engineering controls, personal protective equipment, gas monitoring etc. should be employed where high concentrations of hydrogen peroxide are used in the workplace. Hydrogen peroxide works by producing destructive hydroxyl free radicals that can attack membrane lipids, DNA and other essential cell components. It is active against a wide range of microorganisms including bacteria, yeast, fungi, viruses, and spores.

High Level Disinfectant at high concentrations.

Greatest efficacy against anaerobic bacteria, enveloped and nonenveloped viruses, vegetative bacteria, fungi and bacterial spores.

High concentrations can be corrosive to equipment, brass, zinc, copper, nickel, silver.

Unstable, particularly when diluted.

Accelerated Hydrogen Peroxide at a 0.5% concentration has shown bactericidal and virucidal activity in 1 minute and mycobactericidal and fungicidal activity in 5 minutes.

Iodophors:

An iodophor is a combination of iodine and a solubilizing agent, but unlike iodine, generally are nonstaining and relatively free of toxicity and irritancy. They are bactericidal, mycobactericidal, and virucidal but can require prolonged contact times to kill certain fungi and bacterial spores.

Intermediate Level Disinfectant

Relatively slow kill times, requires prolonged contact time.

Neutralized in the presence of organic load.

Bactericidal, sporicidal, virucidal and fungicidal.

May dry and crack skin.

Comment [103]: Plagiarized from <http://en.wikipedia.org/wiki/Disinfectant>

Comment [104]: Plagiarized from http://www.cdc.gov/hicpac/pdf/Disinfection_Sterilization/Pages42_47Disinfection_Nov_2008.pdf

Comment [105]: Plagiarized from http://www.bccdc.ca/NR/rdonlyres/EA94ACF-02A9-4CF0-BE47-3F5817A25669/0/InfectionControl_GF_DisinfectntSelectnGuidelines_nov0503.pdf

Comment [106]: Plagiarized from http://www.perfectlives.com/pdf/perfectshield/COMPARISON_DISINFECTANT_PRODUCTS.pdf

Comment [107]: Plagiarized from http://www.cdc.gov/hicpac/disinfection_sterilization/7_0formaldehyde.html

Comment [108]: Plagiarized from http://www.cdc.gov/hicpac/pdf/guidelines/Disinfection_Nov_2008.pdf

Comment [109]: Plagiarized from http://www.bccdc.ca/NR/rdonlyres/EA94ACF-02A9-4CF0-BE47-3F5817A25669/0/InfectionControl_GF_DisinfectntSelectnGuidelines_nov0503.pdf

Toxic if ingested

Solutions can stain fabrics, plastics, and some synthetic materials.

Corrosive to metal and rubber

Can cause sensitivity and allergic reactions.

Phenols and Phenolics: Sporidicin, LysoL TB-Cide Plus

Phenolics can be divided into two commonly found groups: ortho-phenylphenol and ortho-benzyl-para-chlorophenol. In high concentrations, phenol acts as a gross protoplasmic poison penetrating and disrupting the cell wall and precipitating the cell proteins. Low concentrations of phenol and higher molecular-weight phenol derivatives cause bacterial death by inactivation of essential enzyme systems and leakage of essential metabolites from the cell wall. They are bactericidal, fungicidal, virucidal, and tuberculocidal. They are not sporicidal. Phenolics are absorbed by porous materials and the residual disinfectant can irritate tissue. Because of this residual toxic effect, phenolic manufacturers are finding markets where claims of residual killing power for months on a hard surface is a benefit. But, it is important to reiterate that they accomplish this by leaving behind a toxic residue that can cause skin irritation to humans...especially children. The use of phenolics in nurseries has been questioned because of hyperbilirubinemia in infants placed in bassinets where phenolic detergents were used. It is corrosive to rubber and certain plastics. It's flammable. It can leave a film on the surface, creating a build-up that eventually must be removed. Some find the smell noxious. When used in food processing areas, or anywhere a surface is likely to be touched, the phenolic must be rinsed away prior to re-occupancy. Thymol, a phenolic derived from the herb thyme, is the active ingredient in some broad spectrum disinfectants that bear ecological claims.

Comment [110]: Plagiarized from <http://www.birdsnways.com/wisdom/ww6eiv.htm>

Comment [111]: Plagiarized from http://www.cdc.gov/hicpac/disinfection/sterilization/9_Opeticacidhydroxide.html

Comment [112]: Plagiarized from http://www.cdc.gov/hicpac/disinfection/sterilization/9_Opeticacidhydroxide.html

Comment [113]: Plagiarized from The Effect of Sterilization on Plastics and Elastomers
By Laurence W. McKeen, first edition 1994.

Comment [114]: Plagiarized from <http://ianrpubs.unl.edu/epublic/archive/g1410/build/>

Comment [115]: Plagiarized from <http://ianrpubs.unl.edu/epublic/archive/g1410/build/>

Comment [116]: Plagiarized from http://www.perfectlives.com/pdf/perfectshield/COMPARISON_DISINFECTANT_PRODUCTS.pdf

✓ Low Level Disinfectant

✓ Effective against bacteria (especially gram +) and enveloped viruses. They are not effective

✓ against non-enveloped viruses and spores.

✓ Maintain their activity in the presence of organic material.

✓ Residue may cause tissue irritation even when thoroughly rinsed.

✓ Not recommended for use on food contact surfaces or in nurseries.

✓ Can be toxic to the skin and eyes.

✓ Depigmentation can occur with long periods of use.

✓ Can cause sinus and respiratory tract problems

✓ Corrosive to rubber and certain plastics

✓ Flammable

✓ Can leave a film on the surface.

✓ Most solutions need to be discarded and remixed daily.

Unpleasant odor.

Quaternary Ammonium Compounds: Shockwave, Cavicide, Envirocide, Microban.

Quaternary ammonium compounds ("quats") are a large group of related compounds that have been shown to be effective low level disinfectants. Some of the names of these quaternaries are alkyl dimethyl benzyl ammonium chloride, alkyl didecyl dimethyl ammonium chloride, and dialkyl dimethyl ammonium chloride. The newer quats (i.e., 4th generation) referred to as twin-chain or dialkyl quaternaries (e.g., didecyl dimethyl ammonium bromide and dioctyl dimethyl ammonium bromide), purportedly remain active in hard water and are tolerant of anionic residues. Typically, quats do not exhibit efficacy against difficult to kill non-enveloped viruses such as *Norovirus*, *Rota virus* or *Polio*. Newer synergistic, low alcohol formulations are highly effective broad spectrum disinfectants with quick contact times (3-5 minutes) against bacteria, enveloped viruses, pathogenic fungi and mycobacteria. Unfortunately, the addition of alcohol or solvents to quat based disinfectant formulas results in the products drying much more quickly on the applied surface which could lead to ineffective or incomplete disinfection.

When used without rinsing, they build up a sticky residue that will attract more contamination. Many are not tuberculocidal or virucidal against hydrophilic viruses. Action is markedly depressed in the presence of organic material. They are also absorbed and/or neutralized by various materials (e.g. cotton, wool) which absorbs the active ingredients.

Low Level Disinfectant

Gram- bacteria may be found growing in the solution

Effective against gram+ and some gram- bacteria and enveloped viruses

Most are not tuberculocidal or virucidal against hydrophilic viruses or non-enveloped viruses, fungi or bacterial spores.

Quats are low in toxicity

Good cleaning agent

Action is markedly depressed in the presence of organic material

May cause respiratory problem

Cationic, incompatible with soap and anionic detergents

Absorbed and or neutralized by various materials (cotton, wool) that absorb the active ingredients

May be inactivated by hard water

Many pathogens are resistant

Potassium peroxymonosulfate: (Virkon S)

Not all disinfectants are designed for protecting humans. Outbreaks among livestock and poultry can be devastating to our food supply, agriculture industry and our economy. Potassium peroxymonosulfate has been proven highly effective against 65 strains of virus in over 19 viral families, 400 strains of bacteria and over 100 strains of fungi. This list of proven efficacy includes the major diseases of concern; *A vian Influenza (H5N1)*, *Newcastle Disease*, *Classical*

Comment [117]: Plagiarized from http://en.wikipedia.org/wiki/Disinfectant#Quaternary_ammonium_compounds

Comment [118]: Plagiarized from http://www.cdc.gov/hicpac/disinfection/sterilization/9_Opeticacidhydroxide.html

Comment [119]: Plagiarized from http://en.wikipedia.org/wiki/Disinfectant#Quaternary_ammonium_compounds

Comment [120]: Plagiarized from <http://web.archive.org/web/20110916025950/http://en.wikipedia.org/wiki/Disinfectant> Web archived with exact wording. July 2011

Comment [121]: Plagiarized from http://www.perfectlives.com/pdf/perfectshield/COMPARISON_DISINFECTANT_PRODUCTS.pdf

Comment [122]: Plagiarized from http://www.perfectlives.com/pdf/perfectshield/COMPARISON_DISINFECTANT_PRODUCTS.pdf

Recognized by industry and governments worldwide as a disinfectant for livestock disease prevention and control, its versatility provides the flexible solution for; surface water and aerial disinfection, in hard water, on porous surfaces, at low temperatures and in the presence of organic challenge. The disinfectant does not elicit a specific toxicologic effect on the target organism, instead it achieves deactivation and/or destruction of the target organism through general oxidative disruption of key structures and compounds vital to normal activity. (e.g. proteins and lipids)

Do not use on acid-sensitive surfaces such as marble, granite, and soft metals such as copper, brass or aluminum.

Pre-test textiles prior to use.

Surface must be rinsed with water.

Effective against bacteria (including mycobacteria), viruses, spores and fungi.

NEW, CUTTING EDGE DISINFECTANTS

There are several new classes of antimicrobials on the market that provides rapid and effective disinfection properties while being safer to use than what we have been using.

Accelerated Hydrogen Peroxide (AHP) is a Hydrogen Peroxide Product that is rated as an EPA list B,C,D,E,F and G disinfectant effective against HIV, HBV, HCN and TB. AHP is a powerful disinfectant with excellent bactericidal, virucidal, fungicidal and sporocidal activity. The unique formulation is based on an innovative technology that effectively destroys pathogens such as *MRSA*, *Hepatitis C*, and *Norovirus*. The chemistry is accepted for dealing with contaminated body spillages, controlling pathogen outbreaks and cleaning high risk infection areas the method of action of the formulation does not promote resistant strain development.

There are two features that really make AHP revolutionary. The first is its one-minute contact time for disinfection. Traditionally, some disinfectants have to dwell on surfaces up to 10 minutes. AHP cleaner disinfectant's one-minute contact time ensures that biorecovery technicians use the product in compliance with disinfection procedures.

When left wet on a pre-cleaned surface for one minute, AHP is designed to be bactericidal and virucidal, which means technicians can kill HBV, HCV and HIV-1 in one minute. With a five-minute contact time it works as a tuberculocide.

Comment [123]: Plagiarized from DuPont's Virkon literature. Berg replaced the word "Virkon" with "potassium peroxymonosulfate" and with "disinfectant."

The second great feature of AHP is its environmental profile. The product does not contain any volatile organic compounds (VOEs) or nonyl phenol ethoxylates-(NPEs). The product does not have a strong fragrance that could be irritating to occupants (especially those with asthma) and the formula's active ingredients break down into water and oxygen.

AHP can be used with microfiber cleaning tools with no loss of its active ingredient and is safe for use throughout healthcare facilities, schools or daycare centers. The product can be used on surfaces such as vinyl, plastic, chrome, glazed ceramic, porcelain and tile and can also be used to disinfect almost any washable food and non-food contact surface where disinfection is required.

And, most important to the BioRecovery Industry, the product also meets the U.S. Occupational Health and Safety Administration's blood-borne pathogen standards for clean-up of blood and bodily fluids.

C. difficile spores in the environment of patients with *C. difficile* associated disease (CDAD) are difficult to eliminate. Bleach (5000 ppm) has been advocated as an effective disinfectant for the environmental surfaces of patients with CDAD. Few alternatives to bleach for non-outbreak conditions have been evaluated in controlled healthcare studies. Alfa, et al. (2010) conducted a prospective clinical comparison during non-outbreak conditions of the efficacy of an accelerated hydrogen peroxide cleaner (12 percent AHP) to the currently used stabilized hydrogen peroxide cleaner (0.05 percent SHP at manufacturer recommended use dilution) with respect to spore removal from toilets in a tertiary-care facility. Alfa, et al. (2010) say their data indicate that the AHP formulation evaluated that has some sporocidal activity was significantly better than the currently used SHP formulation. This AHP formulation provides a one-step process that significantly lowers the *C. difficile* spore level in toilets during non-outbreak conditions without the workplace safety concerns associated with 5000 ppm bleach. Their research was published in BMC Infectious Diseases.

Reference: Alfa MJ, et al. Improved eradication of *Clostridium difficile* spores from toilets of hospitalized patients using an accelerated hydrogen peroxide as the cleaning agent. BMC Infectious Diseases 2010, 10:268 doi:10.1186/1471-2334-10-268.

Alcohol/Quaternary Ammonium Compounds

Recently, formulations that combine various traditional disinfectants into more effective solutions have emerged in the disinfection marketplace. One that offers the best of both products are the Alcohol and Quat compounds. These solutions work synergistically to disinfect.

Comment [124]: Plagiarized info found in a number of places, including www.virox.com/msds/pdf/CarpeDiemTb.pdf, www.diversey.com/File%20Library/Oxivir/LIT749_Oxivir_Brochure.pdf, www.parish-supply.com/documents/438.pdf

greater variety of target organisms and do it faster than either could alone.

Vaporized Hydrogen Peroxide (VHP), Peracetic Acid, Chlorine Dioxide, and compounds containing silver have all shown promise as high level disinfection agents. Combined with high-tech delivery devices such as electro-static sprayers, automated foggers, and ionization devices, this emerging technology shows great promise in helping to tackle the "super-bugs" of today as well as tomorrow.

EFFICACY OF COMMON ANTIMICROBIALS AGAINST PATHOGENS BY CATEGORY

	Quats	Phenols	Hypochlorite	Alcohols	AHP	VHP	Quat/Alcohol	Iodophors
Non-Enveloped Viruses, ie. HAV	no	no	yes	partly	yes	yes	partly	yes
Fungal	yes	yes	yes	partly	yes	yes	yes	yes
Bacterial Spores	no	no	yes	no	partly	yes	no	no
Enveloped viruses	yes	yes	yes	yes	yes	yes	yes	yes
Mycobacteria	no	yes	yes	yes	yes	yes	yes	yes
Gram + Bacteria	yes	yes	yes	yes	yes	yes	yes	yes
Gram - Bacteria	partly	partly	yes	yes	yes	yes	yes	yes
inactivated by organic materials	easily	partly	easily	partly	partly	easily	easily	partly

MICROBIAL RESISTANCE TO BIOCIDES

Super Resistant Pathogens

(Killed by Some High-Level Disinfectants and Sterilants)

PRION

Creutzfeldt-Jakob Disease

Highly Resistant Pathogens

(Killed by High Level Disinfectants and Sterilants)

BACTERIAL SPORES

Bacillus subtilis, Clostridium sporogenes, C. tetani, C. difficile, C. botulinum

MYCO BACTERIA

Mycobacterium tuberculosis, Mycobacterium bovis, Mycobacterium chelonae

Intermediate Resistant Pathogens

(Killed with Intermediate Level Disinfectants)

FUNGUS

Trichophyton sp., Cryptococcus sp., candida sp., aspergillus

NON-ENVELOPED NON-LIPID VIRUSES

Polio virus, Coxsackievirus, Rhinovirus, Norwalk-like virus, HA1

Least Resistant Pathogens

(Killed with Low Level Disinfectants)

LIPID VIRUSES (Enveloped)

Cytomegalovirus, RS V, Herpes Simplex, HBV, HCV, HIV, hantavirus, varicella

Protozoa

VEGETATIVE BACTERIA

Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella choleraesuis, coliforms

CHAPTER
8
Personal
Protective
Equipment

Personal Protective Equipment (PPE)

OSHA mandates protection of employees through the use of "engineering and work practice controls". Part of this protection includes the use of Personal Protective Equipment (PPE).



Protection is the key to minimizing exposure and the resultant financial and legal problems associated with exposure to microbial pathogens. When used properly and consistently, PPE provides protection in the form of impenetrable barriers, which if intact, will prevent exposure to blood, fluids, and airborne particulate. In order to reduce or eliminate the potential for exposure, these routes of exposure must be cut off through the use of barrier material. The most commonly used materials for this task are found in gloves, masks, jump suits, and respiratory filters. These materials are selected and recommended because they can be used once and discarded. This is important because one-time use products can be discarded with the other bio-hazardous waste, thus eliminating the chance of cross-contamination, or exposing your other laundry to biohazards that could be brought home on non-disposable clothing.

Starting from the top of the head, we will address each type of protection, and the proper methods of wearing and removing each article of PPE.



HHEAD - splashes, airborne particulate, and dripping from a ceiling can contaminate the head and hair of a technician if proper precautions are not taken. A hood with an elastic band or drawstring to draw the hood tight about the face is an effective barrier. Disposable coveralls or jumpsuits can be purchased with the hood as an integral part, and provide not only head protection, but continuous protection down the back of the neck as well.

Glasses with side splash protection, and goggles.



EYES: Eyewear is an essential component of protection. Splashes, airborne particulate, and even chemical liquid or vapor can be a great danger to the technician. The eyes are the most exposed and easily contaminated part of the body. A fluid splash or airborne contaminant could easily enter the body through the wet mucosa of the eye. Eye protection can be accomplished by face shield, or by goggles or glasses with wrap around side protection and browguard. If you wear prescription glasses, there are many styles of protection that will fit over your glasses.

The heat and body perspiration you produce while cleaning may produce fog in the goggles, so be sure to wear fog resistant brands to reduce the chance of contamination caused by trying to clear the fog from standard goggles.



Disposable Face Shield

This non-toxic particle Mask is designed to be used against nuisance level and non-hazardous dusts. It is not designed for use as respiratory protection against microbes.



NOSE / MOUTH: Splashes, airborne particulate, and odors are obvious reasons to protect the nose and mouth. Keeping them covered also protects the technician from the natural and often unconscious reflex of scratching or rubbing the nose, cheek, etc. when there is an itch. This normal action occurs frequently and results in an exposure by the direct transfer of the contaminant from the gloved hand to the mucous membranes of the nose or mouth. A standard surgical mask can be used to filter most airborne particulate and splashes. An extra measure of protection can be afforded by the use of a HEPA (High Efficiency Particle-Airborne) mask. These same masks are worn by health care personnel to reduce exposure to airborne viruses, and other particulate. The high efficiency of these masks gives additional protection and peace-of-mind to the technician.



N-95 particulate respirators are available with or without the exhalation valve shown here. It is an effective facepiece respirator that is 95% efficient at stopping solid and liquid particulates free of oil at 0.3 microns

in situations where airborne pathogens are present, or chemical use produces irritating vapors, a full-face or half-face respirator may be required to protect not only the respiratory tract, but the eyes as well. These devices (commonly called gas masks) offer superior protection from both pathogens and fumes. Specific filter cartridges must be purchased to match the mask with the specific task. Cartridges contain multiple types of filters that can be "stacked" to afford protection from a combination of hazards. The most common combination is HEPA and Organic Vapor filters. Stacking filters does however increase the airflow resistance, which makes breathing slightly labored.

Full Protection:

Air and fluid-resistant suit, complete with integral hood, wristlets, and booties.

NFPA-approved nitrile gloves.

A full-face respirator with stacked cartridges for HEPA and Organic Vapor



The use of respirators is regulated by OSHA, and fit-testing must be performed to assure a tight seal. This testing is usually accomplished with a test kit that produces a non-toxic irritant gas, which is placed near the face of the technician. If no irritant reaches the technician through the mask seal, the applicant is approved to wear that particular type and size of mask. Facial hair can interfere with the effectiveness of a respirator seal, therefore, shaving is recommended prior to respirator use. Medical clearance for a technician to wear a respirator must be obtained to assure that an existing lung or heart problem will not be aggravated by the increased respiratory effort needed to breath through the mask.

BODY: Splashes, kneeling in fluid, airborne particulate, drips, etc. can be a danger by direct exposure of the body through an open wound or sore, or by the transfer of the pathogen from exposed clothing to a vulnerable site. Disposable protective Cover-A-alls rated against fluid and particulate penetration are a necessity. When worn properly, these suits provide excellent protection. They also reduce the chance that the technician's family could be exposed to pathogens that could have been brought home on non-disposable "street" clothing. Coveralls are designed larger to accommodate covering street clothing. Therefore, it is recommended that the size you select is based on your coat size or coat size plus one size.



When working in a full suit, rest frequently and drink plenty of liquids. Only wear suits that are tested and certified by the ASTM test method. This test is recognized as state-of-the-art and is the industry standard for measuring permeation of liquids and gases through protective fabrics. Suits with hoods, elastic wristlets and built-in booties offer the greatest protection.

HANDS: The hands are the most vulnerable to open wounds. They are exposed to abrasion, puncture, splash, drips, airborne particulate, contact, etc. Therefore, the selection of gloves is paramount to the level of protection needed. Although Vinyl, Latex, and Nitrile gloves are available, Latex and Nitrile gloves are recommended as they offer the best overall protection. Select only the heaviest of gloves (6 mil. minimum, 15 mil. preferred), and always wear two pair. This will allow you to remove one pair when they get messy, and still keep your hands protected. Often, gloves will tear. The doubling of gloves affords an extra level of protection against exposure due to tearing. Ensure the gloves selected are NFPA 1999 certified for high-risk. The selection of Nitrile or Latex is a personal one. Some wearers of Latex gloves have developed allergic reactions causing their hands to break out in a rash or cause respiratory problems. Nitrile affords protection without the problems related to allergy. Be sure to select gloves that are long (14" minimum) and designed to offer wrist protection. The wristlet of the glove must overlap the suit sleeve by at least two inches to afford wrist protection. (tape the overlap area with duct tape to avoid slippage and wrist exposure).

To remove contaminated gloves: (1) grasp the cuff of your right glove with the thumb and forefinger of your left hand; (2) pull the right glove down over your hand, causing it to become inside-out as you pull; (3) once it is completely pulled off, it should be inside-out and being held by your left thumb and forefinger; (4) ball the right-hand glove up with your left hand, and hold it there – taking care not to touch anything with your right hand; (5) using your right thumb and forefinger, grasp the very edge of the cuff of the left glove; (6) pull the left glove down over your left hand (and the balled-up right glove); (7) continue to pull until the left glove is completely off the hand and is inside-out with the right-hand glove inside it; (8) Dispose of the gloves as biohazardous waste; (9) wash your hands.

Kevlar gloves: Kevlar is the same material used in the manufacture of bullet-proof vests. Kevlar gloves are highly resistant to sharp-edged objects such as broken glass, metal shards, or other sharp objects that can cause cuts. They also offer some additional protection against puncture from needles, but they are not designed for puncture protection. Wear the Kevlar gloves between layers of latex or nitrile gloves, so that they are protected from both outside blood and inside perspiration.

Leather Gloves: Leather gloves can be worn when working around sharp objects. Be sure to wear nitrile or latex gloves under the leather gloves; and if the leather becomes contaminated, they must be discarded as biohazardous waste when you are finished.



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Comment [125]: Berg invented nothing here. The medical industry has been doing this for decades.

2 →



☒ 3, 4, 5, 6

7,8

☒



FEET: Drips, splashes, and contact can contaminate shoes. Boots or booties offer substantial protection when worn over the technician's shoes. Some booties have reinforced soles that are quite durable, and will provide protection from cross-contamination by eliminating the possibility of tracking contaminants home on the soles of the technician's shoes. By wearing a second pair of booties, the technician can remove the soiled booties before walking through uncontaminated areas, then put them back on when returning to the contaminated area. There are several options in foot wear. Some technicians prefer short hazmat boots because they are strong, have steel toe and sole protection, and are easily cleaned and disinfected. Others prefer the disposable vinyl boot. These boots offer liquid and particle protection and can be discarded after use without the need for decontamination.

Tyvek or Polypropylene shoe covers can be placed over the built in booties of coveralls to give added protection and a quick way to remove contamination from shoes when exiting and re-entering a contaminated area. The downside is they are not made for rough surfaces.



Latex overboots add an extra layer of protection at an economical price. Easy to don and doff, they hold up well under most abusive environments and they are disposable.

Commercial HAZMAT boots are expensive but the heavy polyurethane construction and steel toes and shanks give maximum protection. They are not generally disposable and must be decontaminated after each use.



RESPIRATORY PROTECTION

Environmental hazards exist on many job sites that you will be expected to clean. Some of these environmental hazards may be airborne on your arrival. Others may be the result of the work you perform, such as spraying antimicrobials. These often-invisible contaminants can cause severe health problems if you are exposed to them without respiratory protection. Each circumstance may require an evaluation of the risk, followed by the proper selection of a respirator to protect you from harm.

After receiving medical clearance to wear a respirator, fit testing is the next step in assuring that the respirator you select will function properly when applied to your individual facial structure. During this time, you will learn the proper method to don a respirator and make the proper fit adjustments to assure maximum protection. The fit test will determine your ability to detect the presence of a test agent. If you can detect this test agent while wearing the respirator during the fit test, then the face seal is not sufficient to provide adequate protection.

Dusts, Fumes and Mists can cause irritation of the respiratory tract. This tract includes the nose, mouth, throat, trachea, and lungs. Tissue damage can occur that may make breathing difficult. Dust particles also can clog the lungs.

Gasses and vapors are generally associated with the use of chemicals or off-gassing of liquids and solids. In addition to causing similar damage as dust, fumes and mists, these toxins may damage other internal organs.

WARNING: Oxygen deficiency in the air can cause unconsciousness and death. Make sure that the environment you are working in is well ventilated. Do not enter confined spaces unless you are trained and the space is monitored by a gas meter.

Filtering Facepiece Respirators are made of fibers that trap and hold hazardous particles.

Air Purifying Respirators use cartridges that contain sorbants that hold gasses or vapors; fibers that trap and hold hazardous particles; or both. It is important to use the specific cartridge designed for the hazard and for your respirator.

Before using your respirator, be sure to read and understand all labels and instructions.

Comment [126]:

THIS IS WRONG
A filtering face-piece respirator is a type of air purifying respirator. Not all air purifying respirators use cartridges.

Berg needs to stop teaching respiratory protection if he doesn't know this; he could kill someone.

Remember that only a properly fitted respirator will offer protection. Use only respirators that you have been successfully fit-tested for. If the shape of your face changes (fractures, surgery), or dental configuration changes (dentures, tooth loss) you must be retested for proper fit.

You must also self-test your Air Purifying Respirator prior to each use. First, do a Negative Pressure test by placing the palms of your hands over the openings in the cartridges and try to inhale for ten seconds. If the seal is good, the mask will pull-in toward your face. Next, perform a Positive Pressure test by placing your palms over the exhalation ports of the mask and exhale lightly. If the seal is good, you should feel pressure inside the mask.

If you wear glasses, you may need to contact your employer if the glasses interfere with the mask.

Filtering Facepiece Respirators are designed to be thrown away after a single use. If it becomes clogged or otherwise ineffective, throw it away and obtain another respirator.

Air Purifying Respirators should be washed in warm water with a mild detergent. The unit should be sanitized per the manufacturer's instructions. While cleaning, inspect the unit for damage. If you locate damage, contact your supervisor. Let it air dry, then store it in an airtight container. Place the container in a cool, dry place. Cartridges should be removed and sealed in their own small airtight container until needed.

PROCEDURES FOR SELECTING RESPIRATORS

You will be exposed to a variety of environments that will require the use of a respirator. For work in an environment that has the potential to contain airborne mold spores, aerosols, bacteria or viruses, a filtering face-piece respirator with a HEPA claim or an Elastomeric Facepiece Respirator (full-face or half-face) with HEPA filter is required.

Comment [127]:

Berg doesn't know the proper term is "user seal check."

Berg - stop teaching respiratory protection. You don't have the right to damage someone's health with your ignorance!

Comment [128]:

Wrong

N95 filtering face-piece respirators were invented for health care professionals working with Tuberculosis patients. A respirator DOES NOT need to be HEPA rated to provide protection against bacteria or viruses.

Also, Berg also doesn't know that the proper term for the rating he is discussing is P-100, not HEPA. What an amateur.

For work in environments where odors, gases, mists and vapors may be present, such as spraying antimicrobials, an Elastomeric Facepiece Air Purifying Respirator with Organic Vapor/Acid Gas Cartridges and HEPA filter are recommended.

****NOTE:** Be aware that only atmosphere-supplying respirators should be used in environments that have the potential to have oxygen levels below 19.5 percent by volume. Atmospheric-supplying respirators are those full-face elastomeric respirators that are supplied with air through a hose connected to a fresh-air source such as an outside compressor or bottled air.



Half-Face Elastomeric Respirator



Full-Face Elastomeric Respirator

NOTE: When putting on all protective equipment, be sure it fits well, is positioned properly, and eliminates exposure. When removing the disposable gloves and suits, remove them in such a way as to be inside-out when removal is completed. This reduces accidental exposure.

When handling the full-face respirator or goggles, be sure to wear clean gloves. Use PPE when cleaning these reusable items (which should be done as soon as practical after the scene cleaning is completed).

POWERED AIR PURIFYING RESPIRATORS (PAPR)

Powered air purifying respirators are essentially a standard APR that is connected by a hose to a belt-mounted air pump. The cartridges that would normally be found on the mask itself are now relocated to the pump where outside air is filtered before being pumped to the mask. This design offers some distinct advantages over standard air purifying respirators:



1. The pump provides the air under pressure, which produces a positive pressure inside the mask. If there were to be a leak in the mask seal, the inside pressure would help prevent any outside air from entering the mask.
2. Breathing is much easier when the mask is pressurized. Normally, the wearer would have to suck air through the cartridges in order to breathe. When using cartridges with several filters or sorbants, breathing can become labored. With a pressurized mask, the air is pulled through the filters by the pump, making breathing much easier.
3. Having air flowing through the mask provides a cooling effect, helping to lower the body temperature of the wearer.
4. PAPRs have a much higher protection factor than standard APRs due to the pressurized facepiece, which makes for a much safer environment for the technician.

SUPPLIED AIR SYSTEMS

Supplied air systems are masks that receive air from a tank or from an outside source through a supply line. Unlike APRs that FILTER the air, supplied air systems provide air by connecting the mask to an air tank on the technician's back or by connecting the mask to an air compressor located in a healthy air environment by way of a flexible supply line. These types of systems are utilized when maximum respiratory safety is required. In most disinfection scenarios, APRs and PAPRs are adequate. During a bioterrorism event or outbreak where Biohazard LEVEL 4 pathogens are expected to be encountered, supplied air would be the device of choice. Special training is necessary to be permitted to utilize these devices, including the 40 hour HAZWOPER course.

Comment [129]: WRONG

Using a supplied air respirator does not require the user to obtain a 40-hour HAZWOPER certification. Berg is just making up stuff here.

HYGIENE PRACTICES

In order to minimize exposure to pathogens, regardless of the PPE used, there are certain practices that must be enforced:

HANDWASHING: At the completion of a task, when gloves are removed, always wash your hands. (This is in case there was a microscopic hole in the gloves that allowed a pathogen in). Anytime a contaminant gets on the skin, whether intact or not, the site should be thoroughly washed immediately with soap and water. (If soap and water is not available, an alcohol gel or other antiseptic cleanser may be substituted until washing with soap and water is performed. If there are scabs or sores on the skin, be gentle, avoiding opening these and exposing them to microbial infection.

FUNCTIONS TO AVOID: Whenever you are in an area of biological contamination, or are wearing PPE that has been in contact with the contaminated area, you must NOT:

Eat or bring food

Drink or bring drinks

Apply cosmetics or lip balm

Smoke



**CHAPTER
9
Bloodborne
Hazards**

BLOOD SPILLS

Whether from a criminal attack, self-inflicted wound, industrial accident or medical condition, blood spills put those who clean them up at risk for disease transmission.

DISEASES ASSOCIATED:

Human Immunodeficiency Virus (HIV)

Hepatitis B Virus (HBV)

Hepatitis C Virus (HCV)

Gonorrhea and other sexually transmitted diseases (STD)

METHODS OF TRANSMISSION 1

NOTE: dried blood is to be considered just as hazardous as wet blood as Hepatitis B Virus has been found to survive in dried blood well in excess of one week. Anecdotal evidence shows HBV living for over a month in dried blood.

Wet or dried blood in the eyes

Wet or dried blood in the nose

Wet or dried blood in the mouth

Wet or dried blood to any mucous membrane

Puncture from blood-contaminated object such as broken glass or needle

Blood in contact with open wound such as laceration or abrasion

Blood in contact with unhealthy skin such as dermatitis

OTHER HAZARDS

Some blood spill scenes can be horrific to view. The psychological trauma associated with some scenes can last a lifetime and sometimes results in worker's compensation claims for treatment of post-traumatic shock. Selection of someone to clean a spill should be considered carefully.

REGULATORY COMPLIANCE

The Occupational Safety and Health Administration (OSHA) established bloodborne pathogen regulations to protect employees who have the potential to be exposed to blood and bodily fluids. If you are an employer with employees who have reasonable anticipated contact with human blood or potentially infectious materials in the course of their routine work you must:

1. Create a written Exposure Control Plan

2. Provide free training in bloodborne pathogens and document that annual training

3. Provide all Personal Protective Equipment and Engineering Controls free of charge

4. Offer *Hepatitis B* inoculations free of charge, and document.
5. Create a Medical Care and Injury Reporting file and maintain for a minimum of 30 years.
6. Provide the appropriate EPA-registered disinfectants.
7. Follow State regulations to properly package and dispose of the collected blood and fluids.

PERSONAL PROTECTIVE EQUIPMENT

1. Latex or Nitrile gloves of sufficient thickness and length to meet EPA standards.
2. Face Shield or combination of goggles and mask to protect face from splashes.
3. Any other blood-rated clothing to protect the remaining exposed parts of body from contamination.

INOCULATIONS / TREATMENT

Hepatitis B inoculations are available as a series of three injections spaced over a six-month period. Treatment after a *HBV* exposure may be successful if medical treatment is sought immediately. There are no inoculations for *HIV/AIDS* or for *Hepatitis C*. There are some treatments that help reduce the effects.

CLEANING / DISINFECTING

All blood-contaminated surfaces must be pre-cleaned prior to the use of disinfectants. Select a disinfectant that is EPA-registered and has a label claim for disinfecting the targeted disease organisms. Disinfectants that can be legally used for disinfecting blood spills must have a label kill-claim for *Hepatitis B* (*HBV*), and *Human Immunodeficiency Virus* (*HIV*). Follow the directions on the label with special emphasis regarding how long to keep the surface wet with the disinfectant in order to assure complete disinfection.

HUMAN BODY FLUIDS (also included in the term OPIM: Other Potentially Infectious material)

These fluids include: Semen, vaginal secretions, fluids that surround the brain and spinal cord, fluids that surround the lungs, organs, joints, and mother's womb, saliva and any other body fluid that is visibly contaminated with blood. Human urine without visible blood is NOT considered dangerous.

NOTE: The above human body fluids have the same potential to harbor disease as blood does. See BLOOD SPILLS for further information regarding hazard information.

CHAPTER
10
Human Waste
Hazards

Human Feces Contamination

Fecal contamination can be caused by a medical condition, bowel release at time of death, sudden onset of diarrhea, or simply poor personal / toilet hygiene.

Bacterial organisms commonly found in such contamination are *Escherchia coli*, *Salmonella*, and *Shigella* which are gram-negative bacteria that can be found most abundantly in the human body in the gastrointestinal tract. Viruses found in human feces are *Enteroviruses (67 types)*, *Rotaviruses*, *Parvovirus-like agents*, *Hepatitis A virus* and *Adenoviruses (31 types)*. In addition, there are over a dozen protozoa and Helminths(worms) including *Giardia* and *Cryptospondium*. Many of the gram-negative bacteria contain endotoxins that can be released at the time of cell death. Attempts to clean dried feces or aerosolizing fecal material can cause these endotoxins to become airborne, along with possible allergens. These toxins can cause severe health risks for those persons with compromised immune systems such as the elderly, infants, or those undergoing medical treatments that might decrease their immunity.

Comment [130]: Plagiarized from <http://www.infectioncontroltoday.com/articles/2003/09/infection-control-today-09-2003-gram-negative-and.aspx>

Comment [131]: Plagiarized from <http://www.oseh.umich.edu/pdf/guideline/fdrappe.pdf>

Comment [132]: Plagiarized from Berry, M., J. Bishop, C. Blackburn, E. Cole, W. Ewald, T. Smith, N. Suazo, and S. Swan. (1994). *Suggested Guidelines for Remediation of Damage from Sewage Backflow into Buildings*. Journal of Environmental Health 57:9-15.

EXPOSURE ROUTES

Dermal: From fecal contamination getting into breaks in the skin, i.e. cuts, abrasions, punctures, rashes or allowed to accumulate under fingernail beds. Splashes in the eyes, nose or mouth can be absorbed into the body.

Inhalation: Airborne contamination from the aerosolization of wet or dried fecal material can colonize in the respiratory tract of the throat, trachea, or lungs.

Ingestion: Pathogens can be transferred from a surface by hand-to-mouth contact and splashes into the mouth.

CLEANING / DISINFECTING

A number of factors must be considered before work commences.

Timely Initiation of Remediation Services

The longer the contamination remains within the property, the greater potential for the growth of microbial contamination and its associated health risks.

Inspection

A detailed inspection must be conducted to determine the amount of materials effected, the possible damage, and the size of the project. Fabrics (textiles), absorbent construction

materials and other porous materials that are contaminated should be disposed of, unless they are high value and justify extraordinary cleaning/disinfection efforts. If fecal liquids have penetrated underneath flooring, that flooring should be removed, inspected and its salvageability evaluated.



Disposal Considerations

It will be necessary to determine where the collected waste and waste-contaminated materials will be disposed. Determine whether materials and contaminants can be placed in the sanitary sewage system, or whether they must be removed and transported to a remote disposal site. This may be dependent on the quantity of waste, the type of contamination, and local, state, and federal laws.

Re-Occupancy Criteria

Establish when the structure is safe to re-occupy will be determined by the absence of visible signs of contamination, related odors, and testing by ATP meter or surface sampling for laboratory analysis. This may require the services of an indoor environmentalist or industrial hygienist.

Cross Contamination

Cross-contamination brought to previously clean areas on PPE spreads the microbial risk. Restrict movement until plastic sheeting or runners can be placed, and gloves/booties are checked or removed prior to movement from the "hot zone".

Personal Protective Equipment

Due to the microbial pathogens potentially present, full PPE will be required, including but not necessarily limited to: full-face respirator with HEPA and Organic Vapor cartridges, Full

body suit with hood, double layer of Nitrile gloves taped at the wrists*, and liquid resistant boots. * 24" gloves that also protect the forearms offers superior protection

CLEANING

Initial removal of the large feces can be accomplished using a wide plastic putty knife or a shower squeegee coupled with a large dust pan. Collect the fecal matter and place it into a waterproof container or sanitary sewer as determined by your initial evaluation. After removing the heavy organic contamination, a gross decontamination of the surface may be performed using scrubbies, disposable wipes and a cleaning chemical. (Many surfaces contain crevices that may require the use of steam vapor to dislodge stubborn contaminants.) Thoroughly clean the remaining surfaces using enzymatic detergent and scrubbies or microfiber cloths to dislodge and remove any remaining contamination. (A disinfectant/cleaner combination product may be used for this purpose instead of the enzymatic detergent). Remember that any organic soils or other chemical residues from the cleaners left behind will render your disinfectant application ineffective, so be sure to rinse the surfaces with clean, potable water and wipe dry.

DISINFECTION

Select a disinfectant that is EPA registered and has a label claim for disinfecting the targeted disease organisms. Follow the directions on the label with special emphasis regarding how long to keep the surface wet with the disinfectant in order to assure complete disinfection. Wet the surface and allow to air-dry, with the dwell time dictating any re-wetting as needed. If porous structural materials are contaminated and cannot be cleaned or removed, consider sealing the contaminants in the surface using a spray-on sealant.



CHAPTER
11
Foodborne
Hazards

Foodborne Diseases

A foodborne pathogen is an infecting agent, virus, microorganism, or other substance that causes disease. "Food poisoning," as outbreaks of acute gastroenteritis are popularly called, is caused by microbial pathogens that multiply profusely in food. These attacks are either foodborne intoxications or foodborne infections. Their symptoms, which are frequently violent, include nausea, cramping, vomiting, and diarrhea. Foodborne intoxications are caused by toxins formed in the food prior to consumption, and foodborne infections are caused by the activity of large numbers of bacterial cells carried by the food into the gastrointestinal system of the victim. The symptoms from ingesting toxin-containing food may occur within as short a period of time as 2 hours. The incubation period of an infection, however, is usually longer than that of an intoxication.

PATHOGENS ASSOCIATED WITH FOODBORNE DISEASE

Bacillus cereus, *Campylobacterium*, *Clostridium botulinum*, *Clostridium perfringens*, *Listeria monocytogenes*, *Salmonella*, *Norovirus* (Norwalk), *Shigella*, *Vibrio parahaemolyticus*, *Hepatitis A*, *Escherichia coli*, *Staphylococcus aureus*, *Cryptosporidium*, and *Cyclospora cayentensis*.

CLEANING / DISINFECTING: All contaminated surfaces must be pre-cleaned prior to the use of disinfectants. Select a disinfectant that is EPA-registered and has a label claim for disinfecting the targeted disease organisms. Disinfectants that can be legally used for disinfecting must have a label kill claim for the pathogens. Follow the directions on the label with special emphasis regarding how long to keep the surface wet with the disinfectant in order to assure complete disinfection.

Foodborne agents cause an estimated 76 million illnesses and cost \$152 billion annually in the United States. Outbreak surveillance provides insights into the causes of foodborne illness, types of implicated foods, and settings of foodborne infections that can be used in food safety strategies to prevent and control foodborne disease. CDC collects data on foodborne disease outbreaks submitted from all states and territories. In 2007 there were 1,097 reported outbreaks which resulted in 21,244 cases of foodborne illness and 18 deaths. Among the 497 foodborne outbreaks with a laboratory-confirmed single etiologic agent reported, norovirus was the most common cause, followed by *Salmonella*. Among the 18 reported deaths, 11 were attributed to bacterial etiologies (five *Salmonella*, three *Listeria monocytogenes*, two *Escherichia coli* O157:H7, and one *Clostridium botulinum*), two to viral etiologies (norovirus), and one to a chemical (mushroom toxin). Four deaths occurred in outbreaks with unknown etiologies. Among the 235 outbreaks attributed to a single food commodity, poultry (17%), beef (16%), and leafy vegetables (14%) were most often the cause of illness.

Comment [133]: Plagiarized from chapter 8 of Foodservice Organizations, Prentice Hall.

Public health, regulatory, and agricultural professionals can use this information when creating targeted control strategies and to support efforts to promote safe food preparation practices among food employees and the public.

A foodborne disease outbreak is defined as the occurrence of two or more similar illnesses resulting from ingestion of a common food. State, local, and territorial health departments use a standard, Internet-based form to voluntarily submit reports of foodborne outbreaks to the Foodborne Disease Outbreak Surveillance System, and a toolkit for investigation and reporting of outbreaks is used to guide reporting officials. *Norovirus* was the most common cause of illness, accounting for 193 (39%) of the confirmed single-etiology outbreaks and 97% of those caused by viruses. *Salmonella* was the second most common, causing 136 (27%) confirmed single-etiology outbreaks and 53% of those attributed to bacteria. Among *Salmonella* serotypes identified, Enteritidis was the most common, causing 28 confirmed single-etiology outbreaks with 555 illnesses. Shiga toxin-producing *E. coli* (STEC) caused 40 of the confirmed single-etiology outbreaks (15% of those attributed to bacteria), of which 39 were caused by serogroup O157.

The commodities most commonly implicated in outbreaks were finfish (41 outbreaks), poultry (40 outbreaks), and beef (33 outbreaks); the commodities associated with the most illnesses were poultry (691 illnesses), beef (667 illnesses), and leafy vegetables (590 illnesses). The pathogen-commodity pairs responsible for the most outbreak-related illnesses were *norovirus* in leafy vegetables (315 illnesses), *E. coli* O157:H7 in beef (298 illnesses), and *Clostridium perfringens* in poultry (281 illnesses).

Two of the three largest reported outbreaks in 2007 were caused by *Salmonella*. The vehicles were hummus (802 illnesses) and commercially-processed frozen pot pies (401 illnesses and three deaths). The second largest outbreak was caused by *norovirus* at a conference hotel (526 illnesses); several shared food items were the suspected vehicles. The largest outbreaks assigned to a single food commodity were caused by a chicken dish contaminated with *C. perfringens* (132 illnesses), leafy vegetable salad contaminated with *norovirus* (128 illnesses), chili beans contaminated with *C. perfringens* (125 illnesses), and beef contaminated with *E. coli* O157:H7 (124 illnesses).

Reported by: A Boore, PhD, KM Herman, MSPH, AS Perez, MPH, CC Chen, MPH, DJ Cole, DVM, PhD, BE Mahon, MD, PM Griffin, MD, IT WjJjams PhD, Enten's Diseases Epidemiology Br, Div of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases; AJ Hall, DVM, Epidemiology Br, Div of Viral Diseases, National Center for Immunization and Respiratory Diseases, CDC

Comment [134]: Plagiarized from MMWR (Morbidity and Mortality Weekly Report), Vol 59, #31. (2010)

Berg then moves down in the document a few paragraphs to pick up again, starting with "Norovirus was."

Comment [135]: Plagiarized from MMWR (Morbidity and Mortality Weekly Report), Vol 59, #31. (2010)

Comment [136]: Plagiarized from MMWR (Morbidity and Mortality Weekly Report), Vol 59, #31. (2010)

Berg then moves down in the document a few paragraphs to pick up again, starting with "The commodities."

We would like to think that Berg is finally giving his sources their credits; however, as this majority of Berg's "book" is plagiarized through cut and paste, we suspect that Berg just neglected to stop copying after "...(124 illnesses)." Because the next words after that parenthetical bit are "Reported by A Boore, PhD, KM Herman, MSPH, AS Perez,..." and so on.

MOLD CONTAMINATION OF FOOD

When food is left out in the open, especially without refrigeration, airborne mold spores can land on the food, colonize it and use it as their source of nutrition. Molds can be found on meat, poultry, breads, nuts, grain and nearly any other food that has not been treated with preservatives. The molds most often found are *Alternaria*, *Aspergillus*, *Cladosporium*, *Fusarium*, *Geotrichum*, *Penicillium*, and *Rhizopus*. These molds can also be found on many other foods and environmental surfaces. (See more information on these molds at the end of Chapter 16.)

MYCOTOXINS

Mycotoxins are poisonous substances produced by certain molds found primarily in grain and, nut crops, but are also known to be on celery, grape juice, apples, and other produce. There are many of them and scientists are continually discovering new ones. The most notorious toxins are aflatoxins.

AFLATOXIN

Aflatoxin is a cancer-causing poison produced by the *Aspergillus* mold and is found in or on foods and feeds, especially in field corn and peanuts. They are probably the best known and most intensively researched mycotoxins in the world. Aflatoxins have been associated with various diseases, such as aflatoxicosis in livestock, domestic animals, and humans. Aflatoxicosis can lead to liver, heart and kidney damage, and in some cases, convulsions, coma and death. The contamination of the toxin occurs through ingestion or inhalation of the mold spore, where they are absorbed into the tissues of the body.

ENVIRONMENTAL

Food mold can occur anywhere. The most common situations the technician may encounter will be in "hoarder" homes, non-functioning walk-in coolers found in restaurants, homes of persons with physical or mental impairment, and businesses that closed suddenly such as restaurants or food stores.

PROTECTION

Mycotoxins, aflatoxins and mold spores themselves can present a health hazard. The technician must wear protective equipment that prevents skin contact as well as providing respiratory protection, an eye solution, in order to minimize the hazard until it can be properly disposed of and the possible airborne contaminants are contained and scrubbed from the air.

Comment [137]: Plagiarized from http://www.fsis.usda.gov/wps/wcm/connect/a87cdc2c-6ddd-49f0-bd1f-393086742e68/Molds_on_Food.pdf?MOD=AJPERES

Comment [138]: Plagiarized from http://www.fsis.usda.gov/wps/wcm/connect/a87cdc2c-6ddd-49f0-bd1f-393086742e68/Molds_on_Food.pdf?MOD=AJPERES

Anyone who is involved in the cleaning of food-processing venues needs to have a good understanding of not only the method, but the types of soils that can be present.

WATER WARNING: Since water is the major ingredient of most detergents and sanitizing solutions, and is also the primary method of rinsing contaminants away from the surface, we must be sure the water used is as pure as possible. First, water hardness can play a role in decreasing the efficacy of these products, it's pH can inhibit the efficiency of the product, and may even contain microbes that will re-colonize a surface.

Whether visible or invisible, food and food product films left behind on surfaces need to be removed. So do films and residues from dirt, dust, cleaning compounds, oils and other salts and soils. Not all detergents are capable of removing all types of soils equally well, and not even a specific type of soil removal is immune from the environmental effects of time, temperature, or dryness that can interfere with its removal. (Think baked on food deposits).

Many detergents are designed specifically for certain targeted soils. For instance, acid cleaners are designed to dissolve alkaline soils such as minerals. Alkaline detergents react with acid soils and food in order to dissolve them. Using the wrong detergent not only will not work, it may actually make it more difficult to remove the soil. Most foodstuffs that contain sugars, salts or starches are generally soluble in water and are readily removed. Foodstuffs that contain protein or emulsified fats will require the use of an alkaline cleaner/detergent to dissolve them, and soils that contain minerals may require the aggressive use of an acidic cleaner in order to break their surface bonds.

In order to assure that the cleaning process is effective, a proven method of steps should be employed.

The order of steps necessary are:

- 1) Rinsing away any loose debris while wetting the surface. The composition of the surface will dictate how easy it is to clean. Stainless steel and other non-porous surfaces clean much easier than those with a porous surface where microbes can hide.
- 2) Cleaning through agitation, cleaning agents and temperature. In the food industry there are going to be surfaces that are easy to access and clean. These surfaces are often referred to as "Clean-in-Place" or "CIP" surfaces. Some surfaces, however, are hidden and therefore must be some method to move, expose, or disassemble items that prohibit access to a particular surface. This type of cleaning is called "Clean-out-of-Place" or "COOP".
- 3) Rinsing away dislodged material and the detergent, leaving a clean surface.

Application of an approved Sanitizer for the appropriate contact time. The Association of

1) Official Analytical Chemists defines sanitizing food contact surfaces as reducing the contamination level of specific target organisms by 99.999% in 30 seconds. The EPA target organisms used for testing are Escherichia coli and Staphylococcus aureus. (Sanitizing can be accomplished either by chemical use or by the use of hot water or steam.)

Chemical Sanitizing

It is critical to continually re-assess the products you use, and frequently evaluate potential superior products. Although no sanitizer is perfect, one must always be looking for one that has a rapid kill against targeted microbes, does it in a safe manner, under a broad range of conditions, and does it economically.



Regulatory Considerations

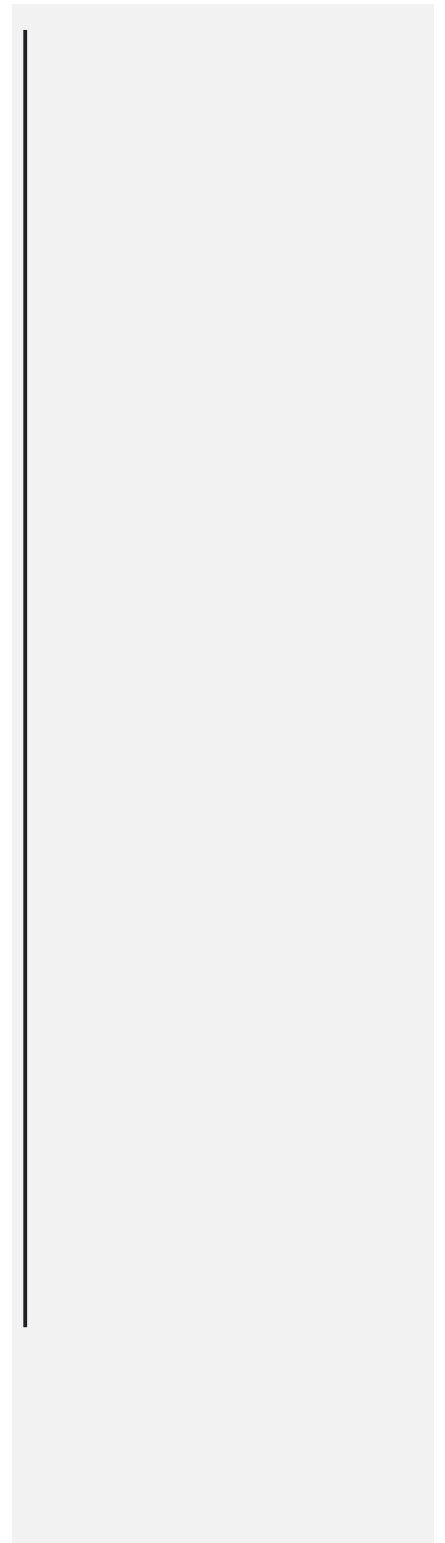
It is important to follow regulations that apply for each chemical usage situation. The registration of chemical sanitizers and antimicrobial agents for use on food and food product contact surfaces and on nonproduct contact surfaces, is through the U.S. Environmental Protection Agency (EPA). (Prior to approval and registration, the EPA reviews efficacy and safety data and product labeling information. The U.S. Food and Drug Administration (FDA) is primarily involved in evaluating residues from sanitizer use which may enter the food supply. Thus, any antimicrobial agent and its maximum usage level for direct use on food or on food product contact surfaces must be approved by the FDA. Approved no-rinse food contact sanitizers and non-product contact sanitizers, their formulations and usage levels are listed in the *Code of Federal Regulations (21CFR178.1010)*. The U.S. Department of Agriculture (USDA) also maintains lists of antimicrobial compounds (i.e., *USDA List of Proprietary Substances and Non Food Product Contact Compounds*) which are primarily used in the regulation of meats, poultry, and related products by USDA's Food Safety and Inspection Service (FSIS).

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2. Boufford, T. 1996. *Making the Right Choice - Sanitizers*. Ecolab Inc. Food & Beverage Div., St. Paul, MN.
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4. Cords B.R. and G.R. Dychdala. 1993. Sanitizers: Halogens, Surface-Active Agents, and Per-oxides. Pp. 36-52. *In: P.M. Davidson and A. L. Branen (eds.) Antimicrobials in Foods*. Marcel Dekker, Inc. New York, NY.
5. Food Code 1995. U.S. Public Health Service, Food and Drug Admin., Washington, DC.
6. *Grade A Pasteurized Milk Ordinance 1995*. Revision. U.S. Public Health Service, FDA, Washington, DC.
7. Marriott, N.G. 1994. Cleaning compounds for Effective Sanitation. Pp. 85-113. Sanitizers for Effective Sanitation. Pp. 114-166. *Principles of Food Sanitation*. Chapman & Hall, New York, NY.

Comment [139]: Plagiarized from Basic Elements of Equipment Cleaning and Sanitizing in Food Processing and Handling Operations. We thought that perhaps Berg was actually citing his sources for this information but all he did was plagiarize an entire section—including THEIR sources! It's just copy and paste. And Berg really thinks that no one is going to notice or catch this?

CHAPTER
12
Introduction to
Zoonotic Disease



Animal Waste—A Reservoir for Zoonotic Disease

Animals, just like humans are susceptible to a variety of diseases. Many of the diseases are considered "zoonotic" (have the ability to be transmitted from animal to human host).

VECTOR: Vector is a term for any living thing that can carry disease-causing organisms from one location to another or one host to another.

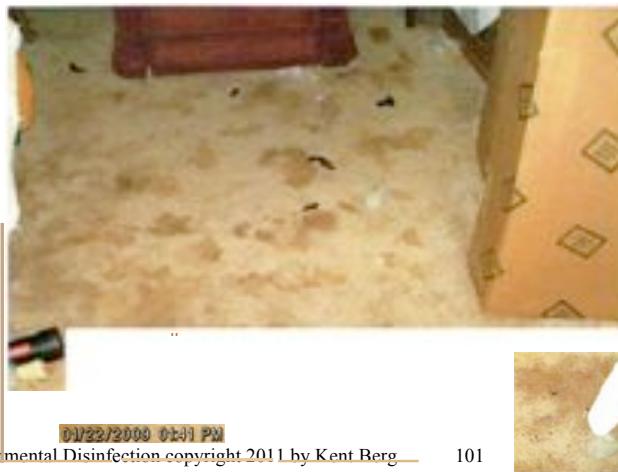
HISTORY OF VECTOR-CARRIED DISEASES

The great plague of London that killed more than half of the city's inhabitants, and the "black death" that devastated Europe for more than 50 years in the 14th century, killing some 25,000,000 individuals, were in part due to the abundance of rats. The plague-infected rats carried plague-infected fleas which in turn infected man. Today, examples of vectors are deer mice that carry *hanta-virus*, and mosquitoes that carry West Nile *Virus*.

Household Pets:

Gastroenteritis is an extremely common problem in both dogs and cats, particularly among puppies and kittens, and the list of possible infectious etiologies for such gastroenteritis is extremely long. Although many of these organisms are most commonly acquired by people as water and foodborne infections, dogs and cats (and other domestic animals) may pose a zoonotic risk. For example, a recent study of cats in Colorado (Hill et al. 2000) demonstrated that 13.1% of cats were shedding zoonotic agents of gastroenteritis in their feces, including 5.4% shedding *Cryptosporidiumparvum*, 2.4% shedding *Giardia intestinalis* and 2.0% shedding either *Salmonella typhimurium* or *Campylobacterjejuni*.

In the following chapters you will learn about the various pathogens associated with other species, the hazards, and the special precautions needed while performing decontamination and disinfection.



Comment [140]: Plagiarized from <http://www.happyhippie.com/vb/printthread.php?t=529&pp=10&page=28>, posted at 05-04-2006, 05:09 AM. We are not sure that the "Happy Hippie" website and the person who wrote this on 05-04-2006 are the original authors, but it certainly proves that Berg is NOT. These words were printed at least as earlier as 2006, so Berg clearly copied and pasted.

Comment [141]: Plagiarized from the Zoonotic Diseases Tutorial, written by Dr. Christopher W. Olsen, Department of Pathobiological Sciences, School of Veterinary Medicine, University of Wisconsin-Madison.

We would like you to know that on the university's website and the page for this tutorial, they have this: **Copyright © 2000 Christopher W. Olsen. All Rights Reserved.** All site contents and their arrangement are copyrighted in the United States and worldwide by international treaty.

**CHAPTER
13
Bird Waste
Hazards**

BIRD FECES

Areas where wild birds roost in large numbers are generally contaminated with equally large amounts of droppings. When this is allowed to continue for a period of time, bacteria and fungi may begin to feed on the droppings and as these pathogens multiply they create a biologically hazardous environment. Primarily, there are three bird species that are considered pest birds that most commonly transmit certain microbial and parasitic agents to humans and domestic animals. They are Pigeons, Starlings and English Sparrows.

PATHOGENS AND DISEASES ASSOCIATED WITH BIRD FECES

Pigeons are implicated in the transmission of over 40 disease, including *aspergillosis*, *candidiasis*, *chlamydiosis*, *coccidiosis*, *cryptococcosis*, *encephalitis*, *erysipeloid*, *histoplasmosis*, *Newcastle disease*, *salmonellosis*, *toxoplasmosis*, *tuberculosis*, *yersiniosis* (*pseudotuberculosis*), *helminths* and *ectoparasites*.

Starlings have been shown to cause more than 20 diseases of humans and domestic animals including TGE (transmissible gastroenteritis) in their feces.



English Sparrows are associated with the transmission of over 25 diseases to human and domestic animals. Nine viruses have been isolated from sparrows.

Of the fungus hazards, *cryptococcosis* and *histoplasmosis* are the two most significant ones involving pest birds.

The fungus feeds on the bird droppings, living saprophytically in the feces and soil. When the fungus is disturbed, the spores are set free and can travel distances of up to a

mile or more. When inhaled, the spores can cause a disease in the lungs (respiratory mycosis), and if not treated can cause death. The National Institutes of Health (NIH) has reported a potentially blinding eye condition called ocular histoplasmosis syndrome (OHS) that results from exposure to pigeon feces or from the fungus car-

rying dust that is on their body. NIH estimates that 4 percent of those exposed to the disease are at risk of developing OHS. OHS may cause damage to the retina, loss of eyesight and blindness in some persons.

These disease organisms that grow in the nutrient-rich accumulations of bird droppings, feathers and debris cause the most serious health risks. A 37-year old



Comment [142]: Plagiarized from *Health Hazards from Pigeons, Starlings and English Sparrows: Diseases and Parasites Associated with Pigeons, Starlings and English Sparrows which affect Man and Domestic Animals*; written by Walter J. Weber in 1979, updated by Phil Waldorf for Bell Environmental Services.

Comment [143]: Plagiarized from *Health Hazards from Pigeons, Starlings and English Sparrows*

Comment [144]: Plagiarized from *Health Hazards from Pigeons, Starlings and English Sparrows*

Comment [145]: Plagiarized from *Health Hazards from Pigeons, Starlings and English Sparrows*:

Comment [146]: <http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1020&context=icwdmbirdcontrol>
Plagiarized from the original by Weber

Comment [147]: Plagiarized from <http://www.geocities.ws/respiratorydisease/histo.html>

Comment [148]: Plagiarized from <http://www.idph.state.il.us/public/hb/hbb&bdrp.htm>.

Comment [149]: Plagiarized from <http://www.idph.state.il.us/public/hb/hbb&bdrp.htm>

Comment [150]: Plagiarized from <http://www.cdc.gov/niosh/nas/rdrp/appendices/chapter6/a6-133.pdf>

mother of five contracted "pigeon lung" from feral pigeons nesting outside her apartment. Her family doctor said: "The fire escape at the back would get pigeon debris on it and was cleaned regularly by the mother and one child at a time. That, we think, is why the mother had the most severe symptoms and died. The father, who did no cleaning, was unaffected." The children are being treated for the illness. The potential for infections (in this case histoplasmosis) to spread downwind is clearly illustrated by an outbreak that occurred when dry soil under a roosting area was bulldozed. People up to one mile away contracted histoplasmosis and the bulldozer operator died after a 7-week illness.

In addition to the previously described hazards, it has been suspected that "Sick Building Syndrome" can also be caused by the build-up of bird droppings in or near HVAC systems, which can cause symptoms such as burning eyes, respiratory problems and headaches.

As in all hazardous clean up situations, all personnel should follow the OSHA regulations for health and safety, including general health and safety, PPE, HAZWOPER, Respiratory Protection, Hazard Communication, Heat, Confined Space and any other related regulations from OSHA, the EPA or other regulator agency. Remember that other hazards may be present that are not related to the bird droppings, but if disturbed are regulated health hazards. These include asbestos and lead paint.

PPE

Full PPE is indicated, including full suit with integral hood, double nitrile gloves, water-proof boots, and full-face respirator with HEPA filters.

SETUP

SAFETY ZONES should be established. The decon area should be equipped with a HEPA-filtered vacuum to vacuum the suits and waste bags. A pump-sprayer with disinfectant should also be utilized to spray down the suits, equipment and bags as necessary prior to exiting. Make sure adequate lighting is available. Heat from the lighting may be an issue, so you may wish to consider fluorescent lighting.

CONTAINMENT

In order to effectively control any airborne particulate that is generated by the cleaning and remediation process, a containment system must be created. The primary containment is generally constructed of a 6 mil. poly sheet barrier, secured on all sides around the droppings. Any nearby ventilation ducts shall be sealed with poly sheeting and duct tape. Create a negative air pressure differential within the containment area using a HEPA filtered air scrubber that is vented to the outdoors. Additional containment may be required, such as sealing doorways.

Comment [151]: Plagiarized from *Health Hazards from Pigeons, Starlings and English Sparrows* but the original article is here: <http://www.sunday-times.co.uk/news/pages/sti/2000/05/21/stinwenws02001.html>.

Comment [152]: Plagiarized from *Health Hazards from Pigeons, Starlings and English Sparrows: Diseases and Parasites Associated with Pigeons, Starlings and English Sparrows which Affect Man and Domestic Animals*. This book was originally written by Walter J. Weber in 1979 but was updated by Phil Waldorf for Bell Environmental Services.

Consideration should be given to the method of removal of the waste from the site. If this requires travel through a building, then plastic runners should be placed on the floor to provide cross-contamination protection from workers' boots. Access to these corridors should be restricted to workers only. Workers inside the HOT ZONE should not routinely carry out the waste, but instead, pass the contained waste out to workers in the WARM ZONE who will double-bag the waste, pass through a HEPA-vacuumed decon station, spray disinfectant on the outside bag, then carry the waste to the waiting dumpster or truck.

CLEANING / REMOVAL

Prior to disturbing the bird feces, water should be misted over the section of feces you will be disturbing. A pump sprayer, paint sprayer, ULV fogger or other similar device can be used to wet the feces to keep the dried material and spores from going airborne when disturbed. Apply as a mist, allowing the liquid to gently wet the feces and not disperse them into the air. This process should be ongoing throughout the removal. Do not use disinfectants to accomplish the wetting task, as the disinfectant's effectiveness is neutralized by the gross contamination. The actual removal of the waste may require shovels, scrapers, brushes or other tools. The collected waste is to be placed in 3 mil plastic bags and sealed. Only fill the bags 2/3 way and use a "goose neck" twist and tape to seal the bags. Larger contaminated items can be wrapped in 6 mil poly and sealed with duct tape. Once gross decon is accomplished, you may help dissolve the remaining waste by the application of a detergent with surfactants such as TSP or *Dissolve-it* by Bird Barrier. Allow the liquid to penetrate (about 15 minutes) before attempting to remove the feces. Then simply scrub the area, wipe up, and then rinse clean. In some situations, the use of a low-vapor steamer can be employed to remove contamination from porous surfaces, nooks and crannies. If the surfaces can not be completely decontaminated (such as porous wood), sealing of the surfaces with a good sealant, using two coats, is to be performed.

DISINFECTION

All contaminated surfaces must be pre-cleaned prior to the use of disinfectants. Select a disinfectant that is EPA-registered and has a label claim for disinfecting the targeted disease organisms. Disinfectants that can be legally used for disinfecting must have a label kill-claim for the pathogens. Follow the directions on the label with special emphasis regarding how long to keep the surface wet with the disinfectant in order to assure complete disinfection. One product for this purpose is Virkon-S, manufactured by DuPont. Generously spray the disinfectant on all surfaces, allowing for proper dwell time. Follow the label directions, including rinsing, if required.

DISPOSAL

Bird waste and its associated contaminated materials can be disposed of in most local landfills. Check with your local landfill and health department to verify that they will accept the waste and if they have any specific requirements for its packaging or handling.

NOTE:

Two excellent references for the removal of bird feces is:

Pigeon Manure: Professional Cleanup, Remediation and Sanitizing Procedures, by Patrick J. Moffet

And

Health Hazards from Pigeons, Starlings and English Sparrows, Second Edition by Phil Waldorf

Comment [153]: Interestingly, Berg mentions Waldorf's book here as a source for how to cleanup bird droppings, but never cites the book as being the source of most of his information. Plagiarization at its best!

DISEASES ASSOCIATED WITH PEST BIRDS

BACTERIAL DISEASES

Erysipelothrix, *Listeriosis*, *Paratyphoid*, *Pasteurellosis*, *Pullorum Disease*, *Salmonellosis*, *Spriochetosis*, *Streptococcosis*, *Tuberculosis*, *Ulcerative Enteritis*, *Vibriosis*, *Yersiniosis*.

MYCOTIC DISEASES

Aspergillosis, *Blastomycosis*, *Candidiasis*, *Cryptococcosis*, *Histoplasmosis*

PROTOZOAL DISEASES

Trypanosomiasis, *coccidiosis*, *Toxoplasmosis*, *Trichomoniasis*

RICKETTSIAL and CHLAMYDIAL

Chlamydiosis, *Q-fever*

VIRAL DISEASES

Encephalitis, *Newcastle Disease*, *Pox*, *Transmissible Gastroenteritis*

PARASITIC CESTODES

Taeniasis

PARASITIC NEMATODES

Capillariasis, *Dispharynxiasis*, *Eyeworm*, *Gapeworm*, *Tetramarlasis*

DERMATOSIS

Acariasis

Comment [154]: And again, plagiarized straight from *Health Hazards from Pigeons, Starlings and English Sparrows*.

**CHAPTER
14
Animal and
Rodent Waste
Hazards**

RODENT AND WILD ANIMAL ASSOCIATED DISEASE

Rodent and animal infestations create ideal incubators for pathogenic microbes. Nesting material, urine, feces, and even saliva can all be potentially biologically hazardous.



PATHOGENS AND DISEASES ASSOCIATED WITH RODENT AND ANIMAL CONTAMINATION:

Hantavirus Pulmonary Syndrome

Rodent(s) involved

Deer mouse (*Peromyscus maniculatus*), Cotton rat (*Sigmodon Hyspildus*), Rice rat (*Oryzomys palustris*), White-footed mouse (*Peromyscus leucopus*)

Agent

Virus

Where the disease occurs

Throughout most of North and South America

How the disease spreads

- Breathing in dust that is contaminated with rodent urine or droppings
- Direct contact with rodents or their urine and droppings
- Bite wounds, although this does not happen frequently

Signs and Symptoms of Infection

Characterized by an abrupt onset of fever lasting 3-8 days, conjunctival infection, prostration, back pain, headache, abdominal pains, anorexia and vomiting, hemorrhagic manifestation appears from third to sixth day, followed by hypotension and shock, mortality is approximately 40-50%.

Leptospirosis

Rodent(s) involved

Rodents and other animals. Although rats, mice and moles are important primary hosts, a wide range of other mammals including dogs, deer, rabbits, hedgehogs, cows, sheep, raccoons, possums, and skunks can be carriers.

Agent

Bacteria

Where the disease occurs

Worldwide

How the disease spreads

- Eating food or drinking water contaminated with urine from infected animals
- Contact through the skin or mucous membranes (such as inside the nose) with water or soil that is contaminated with the urine from infected animals

Signs and Symptoms of Infection

Leptospirosis is a biphasic disease that begins with flu-like symptoms (fever, chills, myalgias, intense headache). The first phase resolves, and the patient is briefly asymptomatic until the second phase begins. This is characterized by meningitis, liver damage (causing jaundice), and renal failure.

Lymphocytic Chorio-meningitis Virus (LCMV)

Rodent(s) involved

house mouse (*Mus musculus*), hamsters, and on occasion, guinea pigs.

Comment [155]: Plagiarized from <http://www.cdc.gov/rodents/diseases/direct.html>

Comment [156]: Berg plagiarized this from *Infectious Disease Index, Hantavirus*, which was prepared by the Office of Laboratory Security, PHAC, for Health Canada
Copyright © Health Canada, 2001.

Comment [157]: Plagiarized from <http://www.cdc.gov/rodents/diseases/direct.html>

Comment [158]: Obviously not written by Berg, we found printed as early as 2007. Plagiarized from <http://insidecostarica.com/dailynews/2007/october/31/nac02.htm>

Agent

Virus

Where the disease occurs

Worldwide

How the disease spreads

- Breathing in dust that is contaminated with rodent urine or droppings
- Direct contact with rodents or their urine and droppings
- Bite wounds, although this does not happen frequently

Signs and Symptoms of Infection

Not all people who are exposed to the virus become ill. Infection symptoms include fever, stiff neck, malaise, loss of appetite, muscle aches, headache, nausea, and vomiting.

Plague

Rodent(s) involved

Wild rodents, including rock squirrels, prairie dogs, wood rats, fox squirrels and other species of ground squirrels and chipmunks

Agent

Bacteria

Where the disease occurs

Western US, South America, Africa, Asia

How the disease spreads

- Bite of an infected flea
- Direct contact with infected animal

Signs & Symptoms of Infection

The typical sign of the most common form of human plague is a swollen and very tender lymph gland, accompanied by pain. The swollen gland is called a "bubo." Bubonic plague should be suspected when a person develops a swollen gland, fever, chills, headache, and extreme exhaustion, and has a history of possible exposure to infected rodents, rabbits, or fleas. A person usually becomes ill with bubonic plague 2 to 6 days after being infected.

When bubonic plague is left untreated, plague bacteria invade the bloodstream. As the plague bacteria multiply in the bloodstream, they spread rapidly throughout the body and cause a severe and often fatal condition. Infection of the lungs with the plague bacterium causes the pneumonic form of plague, a severe respiratory illness. The infected person may experience high fever, chills, cough, and breathing difficulty and may expel bloody sputum. If plague patients are not given specific antibiotic therapy, the disease can progress rapidly to death. About 14% (1 in 7) of all plague cases in the United States are fatal.

Comment [159]: Plagiarized from <http://www.cdc.gov/rodents/disease/direct.html>

Comment [160]: Plagiarized from <http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/lcmv/qa.htm>

Comment [161]: Plagiarized from <http://www.cdc.gov/rodents/disease/direct.html>

Comment [162]: Plagiarized from http://www.cdc.gov/ncidod/dvbid/brochures/Plague_job.pdf

Rat-Bite Fever

Rodent(s) involved

Rats and possibly mice

Agent

Bacteria

Where the disease occurs

Worldwide; *Streptobacillus moniliformis* in North America and Europe; *Spirillum minus* in Asia and Africa

How the disease spreads

- Bite or scratch wound from an infected rodent, or contact with a dead rodent
- Eating or drinking food or water that is contaminated by rat feces.

Signs and Symptoms of Infection

Symptoms usually occur 3-10 days after exposure to an infected animal, but can be as long as 3 weeks. Common symptoms include an abrupt onset of chills and fever, vomiting, headache and muscle pain. By this time, the wound itself has usually already healed. Within 2-4 days after the onset of fever, a rash appears on the hands and feet. One or more large joints may then become swollen, red, and painful.

Symptoms due to "*S. minus*" usually occur 7-21 days after exposure to an infected animal. Common symptoms include fever, ulceration at the rat-bite wound, swollen lymph nodes near the wound, and a distinct rash. This occurs following partial healing of the wound.

Comment [163]: Plagiarized from <http://www.cdc.gov/rodents/diseases/direct.html>

Comment [164]: Plagiarized from <http://www.cdc.gov/rat-bite-fever/symptoms/>

Comment [165]: Plagiarized from <http://www.cdc.gov/rat-bite-fever/health-care-workers/>

Salmonellosis

Rodent(s) involved

Rats and mice

Agent

Bacteria

Where the disease occurs

Worldwide

How the disease spreads

- Eating or drinking food or water that is contaminated by rat feces

Signs and Symptoms of Infection

Comment [166]: Plagiarized from <http://www.cdc.gov/rodents/diseases/direct.html>

Diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts 4 to 7 days, and most persons recover without treatment. However, in some persons, the diarrhea may be so severe that the patient needs to be hospitalized.

Comment [167]: Plagiarized from <http://www.cdc.gov/nczved/divisions/dfbmd/diseases/salmonellosis/>

Tularemia

Rodent(s) involved

Wild rodents, including muskrats, ground squirrels and beavers

Agent

Bacteria

Where the disease occurs

Worldwide

How the disease spreads

- Handling infected animal carcasses
- Being bitten by an infected tick, deerfly or other insect
- Eating or drinking contaminated food or water
- Breathing in the bacteria, *F. tularensis*

Comment [168]: Plagiarized from <http://www.cdc.gov/rodents/disease/direct.html>

Signs and Symptoms of Infection

- **Ulceroglandular** This is the most common form of tularemia and usually occurs following a tick or deerfly bite or after handling of an infected animal. A skin ulcer appears at the site where the organism entered the body. The ulcer is accompanied by swelling of regional lymph glands, usually in the armpit or groin.
- **Glandular** Similar to ulceroglandular tularemia but without an ulcer. Also generally acquired through the bite of an infected tick or deerfly or from handling sick or dead animals.
- **Oculoglandular** This form occurs when the bacteria enter through the eye. This can occur when a person is butchering an infected animal and touches his or her eyes. Symptoms include irritation and inflammation of eye and swelling of lymph glands in front of the ear.
- **Oropharyngeal** This form results from eating or drinking contaminated food or water. Patients with oropharyngeal tularemia may have sore throat, mouth ulcers, tonsillitis, and swelling of lymph glands in the neck.
- **Pneumonic** This is the most serious form of tularemia. Symptoms include cough, chest pain, and difficulty breathing. This form results from breathing dusts or aerosols containing the organism. It can also occur when other forms of tularemia (e.g. ulceroglandular) are left untreated and the bacteria spread through the blood stream to the lungs.

Comment [169]: Plagiarized from http://www.cdc.gov/tularemia/Tul_Si_gnssymptoms.html

CLEANING / DISINFECTING

Prior to any attempt at remediation or cleanup, a complete evaluation of the premises should be performed in order to assess existing as well as potential health risks to the building and its occupants once cleaning and remediation procedures are underway. Ventilation ducts, air pressure differentials between floors or rooms, elevator shafts, and other zones that may be corridors or low pressure areas that will draft airborne contaminants from the source to other parts of the property. At this time, any areas of confirmed or suspected contamination should be presumed to contain infectious agents and should be posted with warning signs to that effect. The warning signs should be placed at the eye level of an average person and should include the hazard, the risk, and a contact information (phone #) of the person in charge. In some cases, barriers may need to be erected or access limited by locks or other methods in order to ensure the safety of the public.

As in all hazardous clean up situations, all personnel should follow the OSHA regulations for health and safety, including general health and safety, PPE, HAZWOPER, Respiratory Protection, Hazard Communication, Heat, Confined Space and any other related regulations from OSHA, the EPA or other regulator agency. Remember that other hazards may be present that are not related to the contamination, but if disturbed are regulated health hazards. These include asbestos and lead paint.

PPE

Full PPE is indicated, including full suit with integral hood, double nitrile gloves, water-proof boots, and full face respirator with HEPA filters.

SETUP

SAFETY ZONES should be established, complete with first aid station, eye wash, and rehab area. The decon area should be equipped with a HEPA-filtered vacuum to vacuum the suits and waste bags. A pump-sprayer with disinfectant should also be utilized to spray down the suits, equipment and bags as necessary prior to exiting. Make sure adequate lighting is available. Heat from the lighting may be an issue, so you may wish to consider florescent lighting.

CONTAINMENT

In order to effectively control any airborne particulate that is generated by the cleaning and remediation process, a containment process must be created. Any nearby ventilation ducts shall be sealed with poly sheeting and duct tape. Create a negative air pressure differential within the containment area using a HEPA filtered air scrubber that is vented to the outdoors. Additional containment may be required, such as sealing doorways. Consideration should be given to the

method of removal of the waste from the site. If this requires travel through a building, then plastic runners should be placed on the floor to provide cross-contamination protection from workers boots. Access to these corridors should be restricted to workers only. Workers inside the HOT ZONE should not routinely carry out the waste, but instead, pass the contained waste out to workers in the WARM ZONE who will double-bag the waste, pass through a HEPA-vacuumed decon station, spray disinfectant on the outside bag, then carry the waste to the waiting dumpster or truck.

CLEANING/REMOVAL

Prior to disturbing any feces or dried contaminants, water should be misted over the section you will be disturbing. A pump sprayer, paint sprayer, ULV fogger or other similar device can be used to wet the area to keep the dried material and pathogens from going airborne when disturbed. Apply as a mist, allowing the liquid to gently wet the contaminants and not disperse them into the air. This process should be ongoing throughout the removal. Do not use disinfectants to accomplish the wetting task, as the disinfectant's effectiveness is neutralized by the gross contamination. The actual removal of the waste may require shovels, scrapers, brushes or other tools. The collected waste is to be placed in 3 mil plastic bags and sealed. Only fill the bags 2/3 way and use a "goose neck" twist and tape to seal the bags. Larger contaminated items can be wrapped in 6 mil poly and sealed with duct tape. Once gross decon is accomplished, you may help dissolve the remaining waste by the application of a detergent with surfactants such as TSP or a Disinfectant/Cleaner product. Allow the liquid to penetrate before attempting to remove the contaminants. Then simply scrub the area, wipe up, and then rinse clean. In some situations, the use of a low-vapor steamer can be employed to remove contamination from porous surfaces, nooks and crannies. If the surfaces can not be completely decontaminated (such as porous wood), sealing of the surfaces with a good sealant, using two coats, is to be performed.

DISINFECTING

All contaminated surfaces must be pre-cleaned prior to the use of disinfectants. Select a disinfectant that is EPA registered and has a label claim for disinfecting the targeted disease organisms. Disinfectants that can be legally used for disinfecting must have a label kill claim for the pathogens. Follow the directions on the label with special emphasis regarding how long to keep the surface wet with the disinfectant in order to assure complete disinfection. Generously spray the disinfectant on all surfaces, allowing for proper dwell time. Follow the label directions, including rinsing, if required.

**CHAPTER
15
Disease
Outbreaks**

Disease Outbreaks:

There are several types of outbreaks. Some are very localized, such as in a school. Epidemics are larger in scope but limited to a geographic area. Pandemics are global in scope. Many outbreaks are controlled by antibiotics or antiviral inoculations or treatments. What scientists fear today is an outbreak that expands rapidly and has no known antiviral cure. Federal and state agencies would need to build stockpiles of antiviral medications, which would be one of the few tools available against the virus during the early stages of a pandemic. Public health officials expect to use them to treat infected people and to prevent illness in those at risk of infection during the several months it takes to develop a vaccine. However, it is difficult to know whether the specific pandemic strain could rapidly become resistant to the drugs. And the stockpiles may not contain sufficient doses to allow broad prophylaxis as well as treatment in the event of a particularly lethal or fast-spreading virus. That is why venue disinfection will play such an important role in combating lethal, mutating viruses.

PATHOGENS AND DISEASES ASSOCIATED WITH OUTBREAKS

Outbreaks, epidemics, and pandemics may be a human-to-human transmission, animal-to-human transmission, bird-to-human transmission, or a species-specific outbreak that could decimate our food supply, i.e. cattle, pigs, or chickens. In order to eliminate the disease there must be a good understanding of the general properties of each infectious agent and the subtle ways each may persist in the



environment and infect others. Identification of the disease agent is fundamental for designing an appropriate decontamination strategy. The basic microbiological principles of isolation of the source of infection and decontamination of personnel, equipment, vehicles and sites are of major importance. The procedures may appear simple and tedious but persistence and attention to detail are vital for successful elimination of the disease agent.

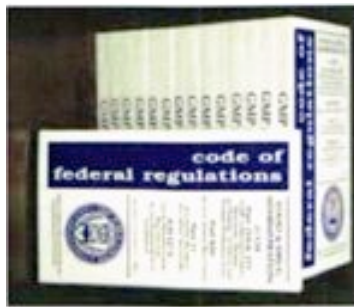
Guidance and oversight by local, state or federal authorities will most likely be in place. Health and Safety plans, remediation strategies, ppe requirements, disinfectant selection, and disposal protocols will most likely be dictated by these authorities. In a large-scale event of epidemic or pandemic proportion however, government guidance could also be scarce.

Comment [170]: Plagiarized from April 25, 2008 FEMA *Emergency Management Higher Education Program Report*

“Federal and state agencies have been building stockpiles of antiviral medications, which would be one of the few tools available against the virus during the early stages of a pandemic. Public health officials expect to use them to treat infected people and to prevent illness in those at risk of infection during the several months it takes to develop a vaccine. However, it is difficult to know whether the specific pandemic strain could rapidly become resistant to the drugs. And the stockpiles may not contain sufficient doses to allow broad prophylaxis as well as treatment in the event of a particularly lethal or fast-spreading virus, the report notes.”

Comment [171]: Plagiarized from *MANUAL ON PROCEDURES FOR DISEASE ERADICATION BY STAMPING OUT*, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS Rome, © FAO 2001

There may be time when you or a local industrial hygienist or indoor environmentalist will have to make critical decisions on your own. This book is designed to help you become better acquainted with the hazards, resources and processes that you will need to know. It is imperative that the reader understand that this book is not intended to be the only resource. In order to perform properly, additional courses in HAZWOPER, respiratory protection, hazard communication, and PPE selection and use are recommended. Familiarization with containment systems, various equipment and chemicals, as well as any additional local, state or federal rules, regulations or laws that apply to the services you may intend to render will also be necessary to assure the service you offer is proper and compliant.



Comment [172]: The EPA expressly forbids using the seal without permission.

Also, OSHA does not allow this logo to be used. The OSHA logo is the property of the United States Department of Labor, and Department policy only allows its use on OSHA and Departmental materials. Furthermore, use of the OSHA logo would create the appearance that OSHA approves, endorses, or sanctions your product. OSHA currently has no statutory basis to allow the use of its logo in this way, and such governmental endorsement is prohibited by Federal ethics rules (5 CFR 2635.702)

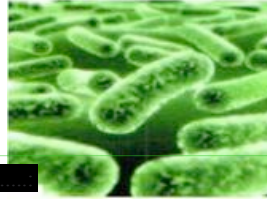
**CHAPTER
16
Common
Pathogens and
Diseases**

Identification of the disease agent is fundamental for designing an appropriate decontamination strategy. A sound understanding of the agent's biological properties and the mechanisms of disease spread can then form the basis for strategic planning. The basic microbiological principles of understanding the source of infection and the processes of decontamination and disinfection are of major importance. Simply stated, in order to eliminate disease, there must be a good understanding of the general properties of each infectious agent and the subtle ways each may persist in the environment and infect its host. The following pages give you an overview of each of the more common pathogenic microbes you may encounter, in order to convey a better understanding and assist you in formulating a sound disinfection plan.

Comment [173]: Plagiarized from
*MANUAL ON PROCEDURES
FOR DISEASE ERADICATION
BY STAMPING OUT*, FOOD AND
AGRICULTURE ORGANIZATION OF
THE UNITED NATIONS
Rome, © **FAO 2001**

Common Pathogens and Disease

Acinetobacter baumannii is a species of pathogenic bacteria called aerobic gram-negative bacillus. It is highly resistant to the majority of antibiotics. It forms opportunistic infections by entering the body through open wounds and invasive medical procedures. It usually infects those with compromised immune systems. Commonly associated with patients with traumatic injuries and severe burns, many reports of *A. baumannii* infections among American soldiers wounded in Iraq earned it the nickname Iraqibacter. MDRAB or MultiDrug-Resistant *Acinetobacter baumannii*, is a new designation, but has always been inherently resistant to multiple antibiotics. *A. baumannii* is associated with high mortality rates of up to 75%. It can attach itself to solid surfaces and..... survive on dry surfaces for as long as 20 to 90 days.



METHOD OF TRANSMISSION: contaminated surfaces and aerosols from coughing, sneezing coming into contact with non-intact skin, eyes, or respiratory tract.

PERSONAL PROTECTIVE EQUIPMENT: Minimum of gloves and respirator.

VACCINATION / TREATMENT: This is a highly resistant bacteria with poor outcomes.

CLEANING / DISINFECTION: All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Avian Influenza Virus (bird flu): Avian influenza is an infection caused by avian (bird) influenza (flu) viruses. These influenza viruses occur naturally among birds. Wild birds worldwide



carry the viruses in their intestines, but usually do not get sick from them. However, avian influenza is very contagious among birds and can be fatal to some domesticated birds, including chickens, ducks, and turkeys. Usually, "avian influenza virus" refers to influenza A viruses found chiefly in birds, but infections with these viruses can occur in humans. Nonetheless, because all influenza viruses have the ability to change, scientists are concerned

that H5N1 strain of the virus one day could be able to infect humans and spread easily from one person to another. Because these viruses do not commonly infect humans, there is little or no immune protection against them in the human population. If H5N1 virus were to gain the capacity to spread easily from person to person, an influenza pandemic (worldwide outbreak of disease) could begin. Should AI spread to humans, it would be spread through aerosolized

Comment [174]: Plagiarized from http://web.archive.org/web/20100330211903/http://en.wikipedia.org/wiki/Acinetobacter_baumannii

Comment [175]: Plagiarized from <http://www.meddirect.org/amdr.cfm?CEProgramID=95&HeaderCEProgramContentID=78>

Comment [176]: Plagiarized from <http://www.cdc.gov/flu/avian/gen-info/facts.htm>. Berg just grabbed sentences here and there and deleted most of the information. Again Berg is trying to make the reader believe that he, Berg, is the author.

droplets caused by sneezing and coughing. These droplets could be inhaled or settle on surfaces that are then touched by other persons and transferred to the mouth, eyes, nose, etc.

METHOD OF TRANSMISSION: contaminated surfaces and aerosols from coughing, sneezing coming into contact with respiratory tract.

PERSONAL PROTECTIVE EQUIPMENT: Minimum of gloves and respirator.

INNOCULATION / TREATMENT: Vaccine is dependant on strain.

CLEANING / DISINFECTION: All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Bacillus cereus, is an aerobic Gram+, spore-forming bacterium that can be found widely in nature including samples of dust dirt cereal crops water, etc. so it is a common contaminant of raw agricultural commodities such as meat and vegetable items, soups and milk products. It can cause two different types of foodborne illness in humans – vomiting very shortly after eating contaminated food or diarrhea after a longer incubation. Starchy foods such as rice or potatoes are commonly associated with *B. cereus* emetic (vomiting) toxin outbreaks. Due to its preparation process, one of the most common food vehicles for transmission of emetic *B. cereus* illness is fried rice, and there have been several reported outbreaks. The spores of *B. cereus* are activated in the initial preparation of the rice which if stored at abusive temperatures (approximately 59 to 104 F or 15 to 40 C) for an extended time will outgrow and produce a toxin that is heat stable and will not be inactivated during subsequent cooking. The emetic (vomiting) form of *B. cereus* has an onset time of 0.5 to 6 hours after consumption, with primary symptoms of vomiting and nausea and occasionally diarrhea. Recovery occurs in less than 24 hours. The diarrheal form of the illness has a mean onset time of between 6 and 15 hours, with symptoms of watery diarrhea pain and nausea persisting for 24 hours.

METHOD OF TRANSMISSION: Eating foods contaminated with the bacterium.

PERSONAL PROTECTIVE EQUIPMENT: Minimum of gloves and respirator.

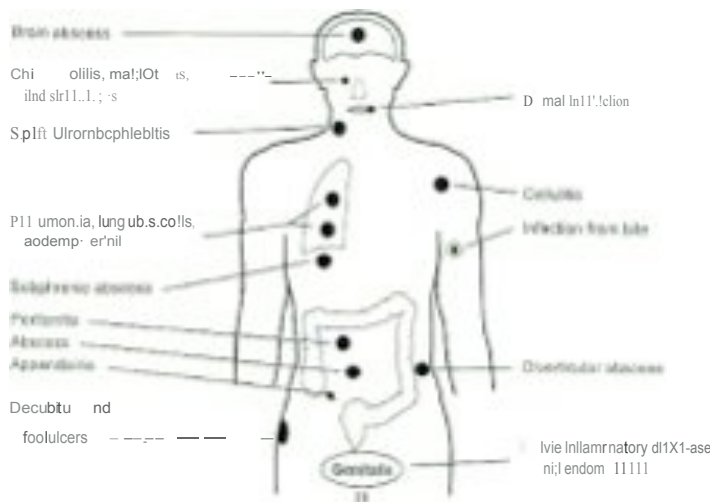
INNOCULATION / TREATMENT: There is no inoculation, however antibiotics can be used to treat infection.

CLEANING / DISINFECTION: All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed. NOTE: *B. cereus* spores are resistant to the disinfectant peracetic acid.

Comment [177]: Plagiarized from <http://www.ecolab.com/our-story/our-company/our-vision/safe-food/microbial-risks/b-cereus>. Berg rearranged the order of some sentences but it is clearly the same article. We also found these exact sentences in other places, most of which reference Ecolab, one of which was posted on 25 October 2010.

Bacteroides are gram-negative, nonsporeforming, anaerobic, and rod-shaped bacteria. They have an outer membrane, a peptidoglycan layer, and a cytoplasmic membrane. *Bacteroides* are commonly found in the human intestine where they have a symbiotic host-bacterial relationship with humans. They assist in breaking down food and producing valuable nutrients and energy that the body needs. When *Bacteroides* escape the gut, they are responsible for many types of infections and abscesses that can occur all over the body including the central nervous system, the head, the neck, the chest, the abdomen, the pelvis, the skin, and the soft tissues. The widely accepted model for abdominal infections goes as follows: disruptions of the intestinal wall, bacterial flora infiltrate the cavity, aerobes (most active part in infection) like *E. coli* start the preliminary tissue destruction and reduces the oxidation-reduction potential of the oxygenated tissue (low oxidation-reduction potential favors anaerobe growth), anaerobic *Bacteroides* start to replicate, and then *Bacteroides* dominate the infection. Along with diarrhea and abscesses, *Bacteroides* have been known to be involved in cases of meningitis and shunt infections, especially in children. Any tissue not normally colonized with *Bacteroides* has a possibility of infection when introduced to mucous or other materials containing *Bacteroides*.

Comment [178]: Plagiarized from <http://microbewiki.kenyon.edu/index.php/Bacteroides> with caches of this information found as far back as 2006; <http://web.archive.org/web/20060902034726/http://microbewiki.kenyon.edu/index.php/Bacteroides> Again, clearly plagiarism. Berg DID NOT write this but he sure is acting like he did.



Baylisascaris procyonis, is a roundworm infection of raccoons. Natural infections have also been recognized in at least 90 species including dogs, rodents, birds, rabbits, otters, badgers, porcupines, chinchillas, prairie dogs, primates, woodchucks, emus, foxes, and weasels. *B. procyonis* infection of humans typically results in fatal disease or severe neurological disorders. The prevalence of *B. procyonis* infection in raccoons is often high, and infected animals can shed enormous numbers of eggs in their feces. These eggs can survive in the environment for extended periods of time, and the infectious dose of *B. procyonis* is relatively low.

Young raccoons and humans and other intermediate hosts become infected by ingesting eggs containing larvae from soils contaminated with raccoon feces (raccoon "latrine" sites may be an important site for infection), whereas adult raccoons become infected by ingesting larvae imbedded in the tissues of intermediate hosts.

- Infection is very common in raccoons.
 - 51-82% seropositivity among raccoons tested in IN, IL and WI
 - 22% of raccoons in urban Atlanta infected
 - 16-32% of raccoon latrines in CA contained infective eggs
- Infected raccoons can shed millions of eggs/day. The eggs embryonate and become infectious about 2-4 weeks later.
- Dogs can be infected as an aberrant host, similar to humans, and can shed eggs in their feces. Cats appear to be relatively resistant to infection.
- CNS disease has been documented in pet rabbits that were maintained outdoors.

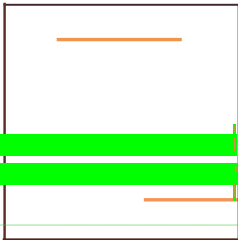
Disease in humans:

- *Baylisascaris procyonis* larvae have a predilection for migration through the Central Nervous System in people, as in other animals.
- Approximately 5-7% of the larvae invade the brain and, because of their large size (up to 2mm in length) and the intense inflammatory response generated, a great deal of tissue destruction occurs. CNS disease is manifest as encephalitis with both peripheral and CSF eosinophilia.



philia.

Although there are only 13 documented cases of *Baylisascaris procyonis* encephalitis in the U.S., these infections are very serious -- 5 of 13 were fatal and survivors may have severe long-term neurologic symptoms. Unfortunately, because of the damage that can occur before the onset of clinical signs, treatment is of limited efficacy.



Comment [179]: Plagiarized from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2730233/> from Emerg Infect Dis. 2002 April; 8(4): 355-359.

Comment [180]: Plagiarized from <http://www.vetmed.wisc.edu/pbs/zoonoses/larvamigrans/baylas.html>. This was taken from <http://www.vetmed.wisc.edu/pbs/zoonoses/default.aspx#anchor287736>, which we have already posted. Berg stole from this website earlier in this "book" he supposedly wrote.

From the website, in case you have forgotten: **Copyright © 2000 Christopher W. Olsen. All Rights Reserved.** All site contents and their arrangement are copyrighted in the United States and worldwide by international treaty. Dr. Christopher W. Olsen, Department of Pathobiological Sciences, School of Veterinary Medicine, University of Wisconsin-Madison, 2015 Linden Drive West, Madison, WI 53706. (608) 265-8681; <olsenc@svm.vetmed.wisc.edu>

Be assured that we will be getting in touch with Dr. Olsen to let him know that Berg is passing off others' works as his own for profit.

This parasite has even been suggested to have potential use as a bioterrorism weapon.

METHOD OF TRANSMISSION: Direct contact with infected feces.

OTHER HAZARDS: Drinking water that has become contaminated with animal feces.

PERSONAL PROTECTIVE EQUIPMENT: Latex or nitrile gloves and a HEPA-filtered respirator is considered minimum equipment. Full protective suits are recommended for cleaning large areas or when dried feces could become airborne dust.

INOCULATION / TREATMENT: There are no inoculations. There is no treatment for *E. procyonis*, and is often times fatal.

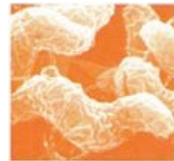
CLEANING / DISINFECTING: First, wet down the area with water (preferably with a wetting agent) or with a hospital-grade disinfectant. While wearing the appropriate PPE, clean up all feces, urine and potentially contaminated items. Physically clean all suspected contaminated surfaces. Apply a final application of hospital-grade disinfectant or 1:10 solution of bleach and allow proper dwell time. **The eggs are extremely resistant in the environment. Disinfection may require flaming the soil or boiling contaminated materials in a solution of 1 lb lye 20 gallons of water.** Double-bag waste and dispose. For large quantities, contact landfill for instructions on disposal.

Campylobacter.

An aerobic gram-negative spiral-shaped bacteria associated with contaminated food.

DISEASE ASSOCIATED:

Campylobacteriosis is caused by *Campylobacter jejuni*: one of the most common bacterial causes of acute bacterial diarrheal illness worldwide. Cases of campylobacteriosis are generally isolated, random events, but outbreaks affecting several people can also occur. The Centers for Disease Control estimates that *Campylobacter* affects over 1 million people every year in the United States, approximately 100 of whom die from the illness. An estimated one in 1,000 cases of campylobacteriosis leads to Guillain-Barre Syndrome, a neurological ailment resulting in paralysis of extremities. Campylobacteriosis typically lasts about one week with the common symptoms of diarrhea, cramping, abdominal pain and fever appearing two to five days after exposure to the organism. In some cases, there may be bloody diarrhea with nausea and vomiting. In immunocompromised people, the organism may spread to the bloodstream and cause a serious infection. Typically, illness occurs more frequently in the summer months than in the winter.



METHOD OF TRANSMISSION:

Transmission of the organism to people usually occurs from consumption of raw or under-

Comment [181]: Plagiarized from <http://www.vetmed.wisc.edu/pbs/zoonoses/larvamigrans/baylas.html>. This was taken from <http://www.vetmed.wisc.edu/pbs/zoonoses/default.aspx#anchor287736>

cooked poultry (primarily), meat and unpasteurized milk. Cross-contamination of raw to cooked items can also be a contributing factor to illness. The bacterium is not typically spread from person to person, although this can happen if the infected person is producing a large quantity of diarrhea. Fewer than 500 *Campylobacter* organisms can cause illness in humans.

Incorrect hygienic practices in the kitchen, such as using utensils and cutting boards to prepare raw poultry followed by the preparation of ready-to-eat foods, can cause cross-contamination and illness.

OTHER HAZARDS: Some people can acquire infection from contact with pets, as many animals asymptotically carry the pathogen in their intestinal tract and excrete *Campylobacter* in their feces. This more commonly occurs when one has contact with the contaminated stool of a symptomatic dog or cat.

PPE: Latex or Nitrile Gloves. If the contamination is aerosolized, respiratory protection and protective suits are recommended.

INNOCULATIONS / TREATMENT: There is no inoculation, however antibiotics can be used to treat infection.

CLEANING / DISINFECTING: All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Candida albicans, a form of yeast, and a causal agent of opportunistic oral and vaginal infections in humans. *C. albicans* is among the many organisms that live in the human mouth and gastrointestinal tract. Under normal circumstances *C. albicans* lives in 80% of the human population with no harmful effects, although overgrowth results in candidiasis. Candidiasis infection is normally mild and easily treatable in otherwise healthy individuals, systemic fungal infections have emerged as important causes of morbidity and mortality in immunocompromised patients (e.g., AIDS, cancer chemotherapy, organ or bone marrow transplantation). In addition, hospital-related infections in patients not previously considered at risk (e.g., patients on an intensive care unit) have become a cause of major health concern.



METHOD OF TRANSMISSION: From surfaces to oral and vaginal mucosa.

PERSONAL PROTECTIVE EQUIPMENT: Minimum of gloves.

INNOCULATION / TREATMENT: There is no inoculation. Treatment is with antifungal drugs.

CLEANING / DISINFECTING: All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Comment [182]: Berg is using a paper by Ecolab—again. Plagiarized from <http://www.ecolab.com/our-story/our-company/our-vision/safe-food/microbial-risks/campylobacter>. As we saw earlier, Ecolabs papers show up in internet caches in at least 2010.

Comment [183]: Plagiarized from wikipedia again, and this paragraph is so common and has been repeated so many times that versions of it show up as early as 2004, http://web.archive.org/web/20040514013352/http://en.wikipedia.org/wiki/Candida_albicans.



Clostridium difficile. This Gram-positive, anaerobic, S-Rod-forming bacillus is the most common cause of infectious diarrhea in hospitalized patients in the industrialized world. C. diff

causes an average of \$3,600 in excess costs per case and an average of 3.6 extra hospital days. In 2005 there were over 300,000 cases of C. diff/C. diff-associated disease recorded in U.S. hospitals resulting in approximately 28,600 deaths. It is transmitted through the bacteria in feces. People become infected when they touch these surfaces and ingest the bacteria by touching their mouths or eating contaminated food. When in the vegetative state the cell dies within 24 hours outside the colon. This would lead one to believe that C. difficile is not a highly transmissible organism. However, C. difficile produces spores that can persist in the environment. In the spore state, C. difficile can survive on surfaces such as door knobs and hospital beds for 70 days and are highly resistant to cleaning and disinfection measures. According to Dr. Jay Glasel, of the University of Connecticut Medical School C. diff spores can persist on dry surfaces up to 5 months. The spores make it possible for the organism to survive passage through the stomach, resisting the killing effect of gastric acid when ingested. After ingestion the spores take up residence in the small intestine and germinate producing toxins that cause disease.

Clostridium perfringens is an anaerobic, Gram-positive, spore-forming rod (anaerobic means unable to grow in the presence of free oxygen). It is widely distributed in the environment and frequently occurs in the intestines of humans and many domestic and feral animals. Spores of the organism persist in soil, sediments, and areas subject to human or animal fecal pollution. Perfringens poisoning is one of the most commonly reported foodborne illnesses in the U.S.

DISEASE ASSOCIATED:

The common form of perfringens poisoning is characterized by intense abdominal cramps and diarrhea which begin 8-22 hours after consumption of foods containing large numbers of those C. perfringens bacteria capable of producing the food poisoning toxin. The illness is usually over within 24 hours but less severe symptoms may persist in some individuals for 1 or 2 weeks. A few deaths have been reported as a result of dehydration and other complications. It is considered the third most common cause of foodborne illness in the United States. PPE: Latex or Nitrile Gloves. If the contamination is aerosolized, respiratory protection and protective suits are recommended.

Comment [184]: Plagiarized from <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/diseases-maladies/cdifficile-eng.php>, 2006

Comment [185]: Original: Kyne L, et al. *Clin Infect Dis*. 2002;34:346-353. www.gehealthcare.com/gecommunity/tip_tv/subscribers/sup.../3354.pdf

Comment [186]: Plagiarized from www.today.com/id/.../t/watch-what-you-touch-bad-germ-gets-worse/ May 2, 2008,

Comment [187]: Plagiarized from <http://www.issa.com/?m=news&event=view&id=2123>, December 2008

Comment [188]: Plagiarized from http://www.apic.org/Resource/_EliminationGuideForm/5de5d1c1-316a-4b5e-b9b4-c3f9eac1b53e/File/APIC-Cdiff-Elimination-Guide.pdf

Comment [189]: Plagiarized from http://www.kaivac.com/a_37-Bringing_Home_Something_Other_than_Homework_from_School_Microbial_Contamination_from_Highly_Touched_Objects

Comment [190]: Plagiarized from http://www.apic.org/Resource/_EliminationGuideForm/5de5d1c1-316a-4b5e-b9b4-c3f9eac1b53e/File/APIC-Cdiff-Elimination-Guide.pdf,

Comment [191]: Plagiarized from <http://www.fda.gov/Food/FoodborneIllnessContaminants/CausesOfIllnessBadBugBook/ucm070483.htm> *Bad Bug Book" from FDA.

Comment [192]: Plagiarized from <http://www.fda.gov/Food/FoodborneIllnessContaminants/CausesOfIllnessBadBugBook/ucm070483.htm> *Bad Bug Book" from FDA.

INNOCULATIONS / TREATMENT: There is no inoculation, however antibiotics can be used to treat infection

CLEANING / DISINFECTING: All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Cryptococcus neoformans var. *neoformans*

Unlike *Blastomyces*, *Histoplasma* and *Coccidioides*, **CRYPTOCOCCUSIS NOT A DIMORPHIC FUNGUS ; IT ALWAYS EXISTS IN A YEAST FORM .**

- Nonetheless, handling infected animals is still not considered an important risk factor for infection with *Cryptococcus*.
- A THICK, POLYSACCHARIDE CAPSULE is produced after *Cryptococcus* organisms enter a host. *In vivo*, the capsule may be immunosuppressive and it inhibits phagocytosis.
- Like *Histoplasma*, this organism prefers soil contaminated with bird droppings worldwide and is often associated with pigeon droppings. The organism has also been found in the feces of pet canaries, budgerigars, cockatoos and other psittacine birds, and exposure to a pet bird has been linked to infection of an immunosuppressed human transplant patient.

As with the other systemic fungi, infection with *Cryptococcus* most often occurs via inhalation of the organism from the environment, followed by primary pulmonary infection and subsequent systemic spread. When dried bird droppings are stirred up this can make dust containing *Cryptococcus* go into the air. People can stir up this dust and then breathe it in when they work, play, or walk in areas where birds have been. Pets, such as dogs and cats, can also get sick with cryptococcosis from this dust, but people do not get cryptococcosis from dogs and cats.

The major species of *Cryptococcus* that causes illness in human is *Cryptococcus neoformans*. *C. neoformans* typically infects immunocompromised persons. Most people in the United States who develop cryptococcal infections are HIV-positive. However, occasionally persons with no apparent immune system problems develop cryptococcosis. Cryptococcal infection may cause a pneumonia-like illness, with shortness of breath, coughing and fever. Skin lesions may also occur. Another common form of cryptococcosis is central nervous system infection, such as meningoencephalitis. People with cryptococcal meningoencephalitis are usually immunocompromised. For these people, cryptococcosis can cause serious symptoms of brain and spinal cord disease such as headaches, dizziness, sleepiness, and confusion.

A person's age and health status may affect his or her immune system, increasing the chances of getting sick. People who are more likely than others to get cryptococcosis include infants, chil-

Comment [193]: Plagiarized from <http://www.vetmed.wisc.edu/pbs/zoonoses/systemic%20mycoses/cryptococcosis.html>

Comment [194]: Plagiarized from <http://www.cdc.gov/healthypets/diseases/cryptococcus.htm>

Comment [195]: Plagiarized from <http://www.healthylifeinfo.com/healthlib/article.asp?file=fungus2010.html>

children younger than 5 years old, organ transplant patients, people with HIV/AIDS, and people receiving treatment for cancer

METHOD OF TRANSMISSION:

Cryptococcal infections are caused by inhalation of airborne fungi. Cryptococcosis is not known to be spread from person to person.

REGULATORY COMPLIANCE

OSHA Respiratory Protection Reg. 29CFR1910.134

PERSONAL PROTECTIVE EQUIPMENT

Latex or nitrile gloves and a HEPA-filtered respirator is considered minimum equipment. Full protective suits are recommended

INNOCULATIONS / TREATMENT: Antifungal medications are used to treat severe cases of acute cases of chronic and disseminated disease. Mild disease usually resolves without treatment. Past infection results in partial protection against ill effects if re-infected

Treatment of meningoencephalitis and other severe infections is usually initiated with an amphotericin B formulation, with or without flucytosine. Fluconazole is used for maintenance therapy in HIV-infected patients with cryptococcal meningoencephalitis, and may be used for patients with milder forms of infection not involving the central nervous system.

CLEANING / DISINFECTING: The goal is to physically remove the waste and the mold. As mold spores become airborne when disturbed by air currents, a containment system should be set up that includes plastic sheet barricades and negative-air machines with HEPA filters employed to keep the spores from spreading beyond the initial contamination zone. Instead of shoveling or sweeping dry, dusty material, carefully wetting the waste and mold with a spray of soapy water or disinfectant can reduce the amount of airborne dust created during removal. Once the material is wetted, it can be collected in double, heavy-duty plastic bags, drums, or other secure containers for immediate disposal. An alternative method is the use of an industrial vacuum cleaner with a high-efficiency filter to suck-up the contaminated material. Arrangements should be made with a landfill operator concerning the quantity of material to be disposed of, the dates when the material will be delivered, and the disposal location. If local or state landfill regulations define material contaminated with *Cryptococcus neoformans* to be infectious waste, incineration or another decontamination method may be necessary. Disinfectants, removal or sealing of contaminated structural components, are commonly employed to meet the cleaning goal. Improper mold remediation is the single-most cause of lawsuits, which are brought by property owners, renters, occupants, and guests.

Cryptosporidium parvum, is a coccidian protozoan, a highly infectious emerging pathogen that can be found in the intestines of infected individuals and causes fever, nausea, vomiting and

Comment [196]: Plagiarized from <http://lymebusters.proboards.com/thread/1879> (Posted March 10, 2006)

Comment [197]: Plagiarized from <http://www.healthylifeinfo.com/healthlib/article.asp?file=fungus2010.html>

Comment [198]: Plagiarized from <http://en.wikipedia.org/wiki/Histoplasmosis>

By the way, this section on Cryptococcosis inoculations and treatment was actually plagiarized from articles on Histoplasmosis. Berg merely changed the name of the disease.

Comment [199]: Plagiarized from <http://www.healthylifeinfo.com/healthlib/article.asp?file=fungus2010.html>

Comment [200]: Now Berg is not even paying attention to what he is doing. He is copying and pasting from another person's work on mold. This section is about cryptococcal infections, not mold. Berg obviously forgot to take out the word "mold."

Comment [201]: Plagiarized from <http://www.cdc.gov/niosh/docs/2005-109/pdfs/2005-109.pdf>, page 7

Comment [202]: Plagiarized from <http://www.cdc.gov/niosh/docs/2005-109/pdfs/2005-109.pdf>, pages 8 and 9

Comment [203]: We are not talking about mold. This is a section on cryptococcal infections. Lazy, lazy, lazy. Copy and paste job from somewhere else. "Lawsuits?"

diarrhea. Although it is self-limiting in most individuals, it is a leading cause of life-threatening chronic diarrheal disease in immunocompromised persons. 10% of AIDS patients are infected and cryptosporidiosis is a leading cause of mortality among AIDS patients.

Life cycle of *Cryptosporidium parvum*.

Infection occurs by ingestion of oocysts excreted in the feces of animals or other humans. These oocysts contain 4 sporozoites that initiate infection of the gastrointestinal tract following ingestion and excystation. The organism replicates to produce new oocysts that are shed into the environment in the feces.

Several points regarding *Cryptosporidium* ecology are important.

- The organism is highly infectious.
 - The median infective dose (from human trials!) is only 132 oocysts, and 20% of human subjects could be infected with as few as 30 oocysts.
- The oocysts are highly resistant to inactivation in the environment.
 - There is no chemical method of inactivation to kill the organism in drinking water.
- There is no routinely successful form of therapy for use *In vivo*.
 - Paromycin has been investigated in cats with persistent diarrhea and in human patients. However, the use of paromycin in cats has been associated with the development of acute renal failure, deafness and cataract formation when the drug is absorbed across damaged intestinal epithelium.

What is the role of animals in the epidemiology of infection in humans?

Person-to-person transmission of *Cryptosporidium parvum* is extremely important, and numerous outbreaks have been documented in childcare and other institutional settings. In addition, there appear to be genotypes of the organism (genotype 1) that are restricted to humans. However, animals are clearly a major source of genotype 2 *Cryptosporidium parvum*.

Comment [204]: Plagiarized from <http://www.vetmed.wisc.edu/pbs/zoonoses/gik9fel/crypto.html>

Cyclospora cayatanensis.

Cyclospora infection is a newly emerging parasitic illness that can cause severe diarrhea.

DISEASE ASSOCIATED:

Cyclospora infection is caused by *Cyclospora cayatanensis*, a microscopic one-celled parasite.

METHOD OF TRANSMISSION:

People most likely get cyclospora infection by eating food or drinking water that was contaminated with stool from an infected person.

INNOCULATIONS / TREATMENT: Cyclospora infection is treatable with antibiotics.

PPE

Latex or Nitrile Gloves. If the contamination is aerosolized, respiratory protection and protective suits are recommended.

INNOCULATION / TREATMENT

There is no inoculation, however antibiotics can be used to treat infection.

CLEANING / DISINFECTING

All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Enveloped vs. non-enveloped viruses: The presence of an envelope makes the virus easier to destroy with most normal cleaning and disinfecting agents. Viruses without an outer envelope are capable of withstanding very high concentrations of chemicals such as chlorine and shows very high tolerance for quaternary ammonium sanitizers.

Enterococcus faecium. Enterococci are aerobic Gram positive bacteria that are commonly found in the bowel of normal healthy individuals. You can be exposed by coming in contact with a contaminated object or person, or by eating contaminated food. Enterococci can cause a range of illnesses including urinary tract infections, bacteraemia (blood stream infections) and wound infections. Vancomycin is a powerful antibiotic that is often the antibiotic of last resort. It is only effective against gram-positive bacteria. It is generally limited to use against bacteria that are already resistant to penicillin and other antibiotics. Vancomycin-Resistant Enterococcus (VRE) is a mutant strain of Enterococcus that originally developed in individuals who were exposed to the antibiotic. It was first identified in Europe in 1986 and in the U.S. in 1988. In healthy people with strong immune systems, the balance of healthy flora in their digestive tract helps keep VRE from getting out of control. However, in people with compromised immune systems - the very young, the very old, and the very ill, VRE is dangerous because it cannot be controlled with antibiotics, and it causes life-threatening infections. It is especially dangerous because it can easily transmit the resistance genes to other more dangerous bacteria such as staph and strep. Even if you don't contract the disease, anyone who comes in contact with the bacteria can become a carrier. Once you become a carrier, you can easily spread the bacteria to friends and family. In addition, if you become a chronic carrier of VRE, you could easily become infected when you are older or in declining health.

In June, 2005 Ecolab Inc. presented a scientific study where VRE was grown in a controlled lab and deposited on samples of bed linen, plastic computer keyboard covers, and acrylic fingernails. Test surface samples were held at room temperature and tested periodically for up to 11 weeks. After the test period, detectable levels of the organism were still present on all surfaces.

Comment [205]: Plagiarized from *Addressing Infections Disease Threats*, Cooperative Agreement #U50/CCU012359. <http://webcache.googleusercontent.com/search?q=cache:Lv6E2d0vdmgJ:www.docstoc.com/docs/85430346/bio-2nd-frontG3+&cd=5&hl=en&ct=clnk&gl=us&client=firefox-a>

Comment [206]: This is a section on cyclospora, not viruses.

Comment [207]: Plagiarized from http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1195733742993

Comment [208]: Plagiarized from <http://www.can-r.com/mediaResources/antibioticResistanceCanada.pdf>

Comment [209]: Plagiarized from <http://www.amazon.com/The-Infectious-Diseases-Concise-Encyclopedia/dp/0816063982>, 1997. <http://books.google.com/books?id=4Xlyaipv3dIC&pg=PA105&lpg=PA105&dq=%22Vancomycin-Resistant+Enterococcus+%28VRE%29+is+a+mutant+strain+of+Enterococcus+that+originally+developed+in%22&source=bl&ots=7okw7tiDIW&sig=ZnI9ikyCZqQTupWmQ2JcpOq9Aq8&hl=en&sa=X&ei=ICyzUvSIFvK72QXujoHYAQ&ved=0CDMQ6AEwAQ#v=onepage&q=%22Vancomycin-Resistant%20Enterococcus%20%28VRE%29%20is%20a%20mutant%20strain%20of%20Enterococcus%20that%20originally%20developed%20in%22&f=false>

Comment [210]: Plagiarized from <http://www.gentlebirth.org/vre/vremain.html>; 1997.

Comment [211]: Plagiarized from <http://investor.ecolab.com/releasedetail.cfm?ReleaseID=206102>

METHOD OF TRANSMISSION: Contact with an object contaminated with human feces or feces-contaminated food.

PERSONAL PROTECTIVE EQUIPMENT: A minimum of gloves and faceshield.

INNOCULATION / TREATMENT: Antibiotic treatment is meeting increasing resistance.

CLEANING / DISINFECTING:

Clean all visibly contaminated surfaces using a disinfectant/cleaner. Thoroughly wet all surfaces with an EPA registered disinfectant with a label kill claim for the target pathogen, and allow proper dwell time.

Escherichia Coli (E-Coli) is a Gram-negative, facultative anaerobic, non-sporulating, rod-shaped bacteria and is one of the main species of bacteria that live in the lower intestines of mammals, known as gut flora. The number of individual E. coli bacteria in the feces that a human excretes in one day averages between 500 billion and 10 trillion. There are approximately 100 strains of E. coli. All of the different kinds of fecal coli bacteria, and all the very similar bacteria that live in the ground are grouped together under the name coliform bacteria. E. coli causes disease by making a toxin called Shiga toxin. Experts believe that the *Escherichia coli* O157 causes an estimated 70,000 diarrheal illness per year in the U.S. and can result in hemolytic-uremic (bloody diarrhea) syndrome and death (O157:H7). It can also cause damage to the kidneys. According to Dr. Jay Glasel of the University of Connecticut Medical School, E coli can persist on dry surfaces up to 16 months.

METHOD OF TRANSMISSION: Eating foods contaminated with the bacterium, airborne through dried feces dust.

PERSONAL PROTECTIVE EQUIPMENT: Minimum of gloves and respirator.

INNOCULATION / TREATMENT: There is no inoculation, however antibiotics can be used to treat infection.

CLEANING / DISINFECTING: All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Giardia intestinalis/duodenalis (formerly *Jamblia*)

This is a flagellate protozoan that inhabits the intestinal tract of a wide variety of domestic and wild animals species. *Giardia* infections in humans are most commonly waterborne from contaminated water sources.

Life cycle of *Giardia*

Giardia trophozoites are binucleate and replicate in the small intestines by binary fission. Once they exit the jejunum, they encyst as they begin to lose moisture content. Within their cyst, they undergo one further division to produce a tetranucleate cyst. This cyst that is passed in the feces is very resistant in the environment and is the infective form for new hosts. When ingested, the tetranucleate parasite emerges from the cyst in the duodenum, rapidly divides into (2) binucleate trophozoites, and proceeds to undergo continued binary fis-

Comment [212]: Most likely ripped off from Wikipedia, we found these exact words as far back as 2006: Plagiarized from

<http://wattsupwiththat.com/2006/12/08/escherichia-coli/>

Comment [213]: Plagiarized from <http://wattsupwiththat.com/2006/12/08/escherichia-coli/>

Comment [214]: Plagiarized from *An Outbreak of Escherichia coli O157 Infection Following Exposure to a Contaminated Building* (2003 American Medical Association) (JAMA, November 26, 2003—Vol 290, No. 20)

Comment [215]: Plagiarized from http://www.kaivac.com/a_37-Bringing_Home_Something_Other_than_Homework_from_School_Microbial_Contamination_from_Highly_Touched_Objects

Epidemiology of *Giardia*.

- Infections in humans are most commonly waterborne. Backpackers and people pursuing other outdoor activities may be infected from what appear to be pristine water sources because of human or animal fecal contamination upstream.
- Beaver and muskrat have been reported to have *Giardia* carriage rates of 16% and >95%, respectively. In addition, pinnipeds in Canada have also been demonstrated to shed *Giardia* cysts.
- The organism survives well in cold water and may not be inactivated by routine chlorination tablet water purification systems. Filtration of water is essential.
- The second most common mode of infection is person-to-person, e.g. in day-care centers.
- Infected dogs and cats can clearly serve as a source for contamination of the environment with the organism and must be considered as potential zoonotic risks. The same may be true for cattle, goats, llamas and pigs, although some isolates from these species appear to represent strains that are restricted only to livestock and have not been recovered from humans. Thus, the overall zoonotic impact of giardiasis in animals remains to be fully understood.

It has been estimated that 1-2% of well-cared for dogs and cats may be shedding *Giardia* cysts at any one time. The rate of shedding increases to ~10% in kennel or shelter environments, and infection and clinical disease are greatest in puppies and kittens, with up to 50% of puppies potentially shedding the organism at any one time.

Giardiasis clinical disease:

Following a 1-2 week incubation period, both people and dogs and cats initially suffer an acute GI'itis with diarrhea. Fever is much less common than with bacterial agents of gastroenteritis. This acute phase of disease may be followed by a CHRONIC syndrome of malabsorptive diarrhea, weight loss and abdominal pain that waxes and wanes over a period of many months.

- The stools may initially be watery, but then typically progress to soft, semi-formed stools with steatorrhea and a rancid, foul odor.
- Patients may also exhibit malaise, nausea, bloating and flatulence.
- The diarrhea may continue indefinitely if not treated. In fact, because of difficulties in diagnosis, empirical treatment of *Giardia* is sometimes considered in cases of chronic, undiagnosed malabsorptive diarrhea.

Actual invasion of enterocytes is rare, but the organism can colonize large portions of the small intestinal tract.

The host immune/inflammatory response may also be a contributing factor in the pathology of *Giardia* infection.

Comment [216]: Plagiarized from <http://www.vetmed.wisc.edu/pbs/zoonoses/gik9fel/giardia.html>

Treatment is available.

CLEANING / DISINFECTING:

First, wet down the area with water (preferably with a wetting agent) or with a hospital-grade disinfectant. While wearing the appropriate PPE, clean up all feces, urine and potentially contaminated items. Physically clean all suspected contaminated surfaces. Apply a final application of hospital-grade disinfectant or 1:10 solution of bleach and allow proper dwell time. Double-bag waste and dispose. For large quantities, contact landfill for instructions on disposal.

Hantavirus - an enveloped virus which causes Hantavirus pulmonary syndrome. Hantavirus pulmonary syndrome (HPS) HPS was first recognized in 1993 and has since been identified throughout the United States. Although rare, HPS is potentially deadly. Several different types of wild mice and rats can be infected with hantavirus and pass it in their droppings, urine, or saliva. The common house mouse does not carry hantavirus, but it is commonly found in Deer Mice. People can get hantavirus when they touch rodent urine, droppings, or places where these animals have nested. Dried droppings or urine can be stirred up in dust and breathed in by people. Hantavirus has not been shown to infect other kinds of animals, such as dogs, cats, or farm animals. The first symptoms of hantavirus pulmonary syndrome are fever, muscle pain, and being tired. This happens 1 to 3 weeks after a person is exposed to hantavirus. Some people also get headaches, dizziness, vomiting, or diarrhea. After about 4 to 10 days, people who are sick with hantavirus infection begin to cough and have shortness of breath. If someone is sick with hantavirus pulmonary syndrome and does not get help quickly, he or she may die.

METHOD OF TRANSMISSION: Hand-to-mouth after touching mouse/rat urine, feces or nesting material. Airborne through contaminated dust.

PERSONAL PROTECTIVE EQUIPMENT: Minimum of gloves and respirator.

INNOCULATION / TREATMENT: There is no inoculation, early treatment is critical to survival.

CLEANING / DISINFECTION: All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Hepatitis A Virus (HAV)

A non-enveloped virus that attacks the Liver. The incubation period of HAV is 15 to 50 days, with the average being 28 days. Most persons treated for HAV completely recover. The fatality rate is about 0.6%.

METHOD OF TRANSMISSION: hand to mouth after touching human feces or sewage.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Latex or nitrile Gloves, Goggles and mask or face shield to protect against splashes or inadvertent touching of face.

INNOCULATIONS / TREATMENT:

Hepatitis A inoculations are available. Post-exposure treatment is also available. There are no inoculations against the other feces-borne pathogens. Treatment medications are available.

CLEANING / DISINFECTING:

Comment [217]: Boilerplate information; exact verbiage found in many places; CDC

Comment [218]: Plagiarized from <http://www.cdc.gov/healthypets/diseases/hantavirus.htm>; Berg just moved things around, changed the order that they are on the website.

All feces-contaminated surfaces must be pre-cleaned prior to the use of disinfectants. Select a disinfectant that is EPA-registered and has a label claim for disinfecting the targeted disease organisms. Follow the directions on the label with special emphasis regarding how long to keep the surface wet with the disinfectant in order to assure complete disinfection.

Hepatitis B Virus (HBV) is a member of the Hepadnavirus family. The virus particle, (virion) consists of an outer lipid envelope and an icosahedral nucleocapsid core composed of protein. Acute infection with hepatitis B virus is associated with acute viral hepatitis – an illness that begins with general ill-health, loss of appetite, nausea, vomiting, body aches, mild fever, dark urine, and then progresses to development of jaundice. It has been noted that itchy skin has been an indication as a possible symptom of all hepatitis virus types. The illness lasts for a few weeks and then gradually improves in most affected people. A few patients may have more severe liver disease (fulminant hepatic failure), and may die as a result of it. The infection may be entirely asymptomatic and may go unrecognized. Chronic infection with hepatitis B virus may be either asymptomatic or may be associated with a chronic inflammation of the liver (chronic hepatitis), leading to cirrhosis over a period of several years. This type of infection dramatically increases the incidence of hepatocellular carcinoma (liver cancer). Hepatitis B virus infection may either be acute (self-limiting) or chronic (long-standing). Persons with self-limiting infection clear the infection spontaneously within weeks to months. Children are less likely than adults to clear the infection. More than 95% of people who become infected as adults or older children will stage a full recovery and develop protective immunity to the virus. However, this drops to 30% for younger children and only 5% of newborns that acquire the infection from their mother at birth will clear the infection. This population has a 40% lifetime risk of death from cirrhosis or hepatocellular carcinoma. Of those infected between the age of one to six, 70% will clear the infection.

METHOD OF TRANSMISSION: Transmission of hepatitis B virus results from exposure to infectious blood or body fluids containing blood.

INOCULATION / TREATMENT: Acute hepatitis B infection does not usually require treatment because most adults clear the infection spontaneously. Early antiviral treatment may only be required in fewer than 1% of patients, whose infection takes a very aggressive course (fulminant hepatitis) or who are immunocompromised. On the other hand, treatment of chronic infection may be necessary to reduce the risk of cirrhosis and liver cancer. Chronically infected individuals with persistently elevated serum alanine aminotransferase, a marker of liver damage and HBV DNA levels are candidates for therapy. Although none of the available drugs can clear the infection, they can stop the virus from replicating, thus minimizing liver damage.

PPE: A minimum of gloves and faceshield are suggested, with full-body protection recom-

Comment [219]: Plagiarized from http://en.wikipedia.org/wiki/Hepatitis_B_virus; Oh, come on, we are supposed to believe that Berg wrote that sentence? Please.

Comment [220]: Plagiarized from http://en.wikipedia.org/wiki/Hepatitis_B

Comment [221]: Plagiarized from http://en.wikipedia.org/wiki/Hepatitis_B

Comment [222]: Plagiarized from http://en.wikipedia.org/wiki/Hepatitis_B

Comment [223]: Plagiarized from http://en.wikipedia.org/wiki/Hepatitis_B#Treatment

mended when splash, or puddles of blood or OPIM are encountered.

CLEANING / DISINFECTION: Pre-clean the contaminated area, then apply the appropriate EPA-registered disinfectant.

Hepatitis C Virus (HCV) is a small (55-65 nm in size), enveloped, single-stranded RNA virus of the family *Flaviviridae*. The hepatitis C virus particle consists of a core of genetic material (RNA), surrounded by an icosahedral protective shell of protein, and further encased in a lipid (fatty) envelope of cellular origin. Although hepatitis A virus, hepatitis B virus, and hepatitis C virus have similar names (because they all cause liver inflammation), these are distinctly different viruses, both genetically and clinically. Hepatitis C virus is the cause of hepatitis C in humans. Hepatitis C virus (HCV) infection is the most common chronic bloodborne infection in the United States; approximately 3.2 million persons are chronically infected.

METHOD OF TRANSMISSION: Transmission of hepatitis B virus results from exposure to infectious blood or body fluids containing blood.

INNOCULATION / TREATMENT: Unlike hepatitis A and B, there is currently no vaccine to prevent hepatitis C infection.

PPE: A minimum of gloves and faceshield are suggested, with full body protection recommended when splash, or puddles of blood or OPIM are encountered.

CLEANING / DISINFECTION: Pre-clean the contaminated area, then apply the appropriate EPA-registered disinfectant.

Histoplasma capsulatum

H. capsulatum is a fungus that grows in soil and material contaminated with bat or bird droppings. Spores become airborne when contaminated soil is disturbed. Breathing the spores causes infection. The disease is not transmitted from an infected person to someone else.

Geographic distribution: The geographic distribution of *Histoplasma capsulatum* largely follows the Ohio, Mississippi and Missouri River valleys.

Histoplasma capsulatum prefers moist soils of high nitrogen content, hence the association with areas of bat guano or bird droppings.

- There is a classic story of Boy Scouts who were infected while doing their good deed cleaning out starling roosts!
- Infection has also been documented in spelunkers.

Recent studies (see Klein, 2000; Sebghati *et al.*, 2000) have enhanced our understanding of how *Histoplasma* persists in the host. This yeast lives in the phagosomes of macrophages and is able

Comment [224]: Plagiarized from http://en.wikipedia.org/wiki/Hepatitis_C_virus

Comment [225]: Plagiarized from http://www.mckinley.illinois.edu/handouts/hepatitis_qa.html

Comment [226]: Plagiarized from <http://www.cdc.gov/hepatitis/hcv/>

Comment [227]: CDC boilerplate, found in multiple websites and papers

to block phagosome/lysosome fusion and phagosome acidification so as to survive this normally hostile environment.

METHOD OF TRANSMISSION: Infections are caused by inhalation of airborne fungal spores.

REGULATORY COMPLIANCE: OSHA Respiratory Protection Reg. 29CFR1910.134

PERSONAL PROTECTIVE EQUIPMENT: Latex or Nitrile gloves and a HEPA-filtered respirator is considered minimum equipment. Full protective suits are recommended.

INOCULATION / TREATMENT: Antifungal medications are used to treat severe cases of acute histoplasmosis and all cases of chronic and disseminated disease. Mild disease usually resolves without treatment. Past infection results in partial protection against ill effects if re-infected. Treatment of meningoencephalitis and other severe infections is usually initiated with an amphotericin B formulation, with or without flucytosine. Fluconazole is used for maintenance therapy in HIV-infected patients with cryptococcal meningoencephalitis, and may be used for patients with milder forms of infection not involving the central nervous system.

CLEANING / DISINFECTING: The goal is to physically remove the waste and the mold. As mold spores become airborne when disturbed by air currents, a containment system should be set up that includes plastic sheet barricades and negative-air machines with HEPA filters employed to keep the spores from spreading beyond the initial contamination zone. Instead of shoveling or sweeping dry, dusty material, carefully wetting the waste and mold with a spray of soapy water or disinfectant can reduce the amount of airborne dust created during removal. Once the material is wetted, it can be collected in double, heavy-duty plastic bags, drums, or other secure containers for immediate disposal. An alternative method is the use of an industrial vacuum cleaner with a high-efficiency filter to suck-up the contaminated material. Arrangements should be made with a landfill operator concerning the quantity of material to be disposed of, the dates when the material will be delivered, and the disposal location. If local or state landfill regulations define material contaminated with *H. capsulatum* to be infectious waste, incineration or another decontamination method may be necessary. Disinfectants, removal or sealing of contaminated structural components, are commonly employed to meet the cleaning goal. Improper mold remediation is the single-most cause of lawsuits which are brought by property owners renters occupants and guests.

Human Immunodeficiency Virus:

Human immunodeficiency virus (HIV) is a lentivirus (a member of the retrovirus family) that causes *acquired immunodeficiency syndrome (AIDS)*, a condition in humans in which the immune system begins to fail, leading to life-threatening opportunistic infections. In 2006, an estimated 56,300 new HIV infections occurred in the U.S. Although the HIV virus is fragile and does not survive well outside its white blood cell host, HIV may survive for up to FOUR

Comment [228]: Plagiarized from <http://www.vetmed.wisc.edu/pbs/zoonoses/systemic%20mycoses/histoplasmosis.html>

Comment [229]: Plagiarized from <http://en.wikipedia.org/wiki/Histoplasmosis>

Comment [230]: Plagiarized from <http://www.medicinenet.com/cryptococcosis/page2.htm>

Oh my god, Berg can't even copy and paste correctly. He is now talking about the treatment for cryptococcosis. He screwed up the entry for Cryptococcosis by putting in information about histoplasmosis, and now he has cryptococcosis in the histoplasmosis section. He can't even keep his plagiarism straight.

Comment [231]: Look back at page 129. This section is about histoplasmosis (supposedly) and he is talking about mold, just like he did on page 129. Just sloppy, lazy copying and pasting.

Comment [232]: Plagiarized from <http://www.cdc.gov/niosh/docs/2005-109/pdfs/2005-109.pdf>,

Comment [233]: Again with the mold? Obviously copied and pasted from another source.

Comment [234]: Plagiarized from <http://en.wikipedia.org/wiki/HIV>

WEEKS in syringes after HIV-infected blood has been drawn up into the syringe and then flushed out and up to four days AFTER the blood has dried. According to Dr. Jay Glasel of the University of Connecticut Medical School, C. HIV can persist on dry surfaces for more than 1 week.

METHOD OF TRANSMISSION: Transmission of HIV virus results from exposure to infectious blood or body fluids containing blood.

INNOCULATION / TREATMENT: Treatment with anti-retrovirals increases the life expectancy of people infected with HIV. Even after HIV has progressed to diagnosable AIDS, the average survival time with antiretroviral therapy was estimated to be more than 5 years as of 2005. Without antiretroviral therapy, someone who has AIDS typically dies within a year.

PPE: A minimum of gloves and faceshield are suggested, with full-body protection recommended when splash, or puddles of blood or OPIM are encountered.

CLEANING / DISINFECTION: Pre-clean the contaminated area, then apply the appropriate EPA-registered disinfectant.

Klebsiella pneumomae is a Gram-negative, non-motile, encapsulated, lactose fermenting, facultative anaerobic, rod-shaped bacterium that is normally found in the mouth, skin and intestines of healthy individuals. It naturally occurs in the soil. Members of the *Klebsiella* genus typically have two types of toxins on their cell surface lipopolysaccharide and polysaccharide. *Klebsiella* infections tend to occur in people with a weakened immune system from improper diet (alcoholics and diabetics). New antibiotic resistant strains of *K. pneumoniae* are appearing and it currently ranks second to *E. coli* for urinary tract infections in older persons. Its primary point of infection is the lungs where it causes pneumonia.

METHOD OF TRANSMISSION: *Klebsiellae* are ubiquitous in nature. In humans, they may colonize the skin, pharynx, or gastrointestinal tract. They may also colonize sterile wounds and urine. Carriage rates vary with different studies. *Klebsiellae* may be regarded as normal flora in many parts of the colon and intestinal tract and in the biliary tract. The bacterium may enter the body through aerosolized contaminants, through open wounds, by ingestion, or through the introduction of contaminated medical instruments into natural orifices. According to Dr. Jay Glasel of the University of Connecticut Medical School, *Klebsiella* spp. can persist on dry surfaces more than 30 months.

INNOCULATION / TREATMENT: There is no inoculation, and treatment regimens consisting of cocktails of a variety of antibiotics have proven to be only marginally effective.

PPE: Full barrier protection. Use respirators if aerosolization is suspected.

Comment [235]: Boilerplate information, found in numerous places at least as early as 2004. <https://www.google.com/search?q=FOUR+++WEEKS+in+syringes+after+HIV-infected+&ie=utf-8&oe=utf-8&aq=t&rls=org.mozilla:en-US:official&client=firefox-a#q=%22FOUR+WEEKS+in+syringes+after+HIV-infected%22&rls=org.mozilla:en-US%3Aofficial>

Comment [236]: Plagiarized from http://www.kaivac.com/a_37-Bringing_Home_Something_Other_than_Homework_from_School_Microbial_Contamination_from_Highly_Touched_Objects

Comment [237]: Found in on a number of websites; here's an example from 2010: <http://www.scodc.org/category/hiv-aids/>

Comment [238]: Plagiarized from http://en.wikipedia.org/wiki/Klebsiella_pneumoniae

Comment [239]: Plagiarized from <http://dhh.louisiana.gov/assets/oph/Center-PHCH/Center-CH/infectious-epi/EpiManual/KlebsiellaManual.pdf> (2010)

Comment [240]: Plagiarized from http://en.wikipedia.org/wiki/Klebsiella_pneumoniae

Comment [241]: Plagiarized from <http://misc.medscape.com/pi/iphone/medscapeapp/html/A219907-business.html>.

Comment [242]: Plagiarized from http://www.kaivac.com/a_37-Bringing_Home_Something_Other_than_Homework_from_School_Microbial_Contamination_from_Highly_Touched_Objects

CLEANING / DISINFECTIO : Pre-clean all contaminated surfaces, then apply the appropriate EPA-registered disinfectant.

Legionella is a Gram negative bacterium, including species that cause legionellosis or Legionnaires' disease, most notably *L. pneumophila*. Once inside a host, incubation may take up to two weeks. Initial symptoms are flu-like, including fever, chills, and dry cough. Advanced stages of the disease cause problems with the gastrointestinal tract and the nervous system and lead to diarrhea and nausea. Other advanced symptoms of pneumonia may also present. However, the disease is generally not a threat to most healthy individuals, and tends to lead to harmful symptoms only in those with a compromised immune system and the elderly.

METHOD OF TRANSMISSION: *Legionella* transmission is via aerosols -the inhalation of mist droplets containing the bacteria. Common sources include cooling towers, swimming pools (especially in scandinavian countries and other countries such as Northern Ireland), domestic hot-water systems, fountains, and similar disseminators that tap into a public water supply. Natural sources of *Legionella* include freshwater ponds and creeks. People get Legionnaires' disease when they breathe in a mist or vapor (small droplets of water in the air) that has been contaminated with the bacteria. One example might be from breathing in the steam from a whirlpool spa that has not been properly cleaned and disinfected. The bacteria are NOT spread from one person to another person.

INNOCULATION / TREATMENT: There is no inoculation. Treatment includes antibiotics.

PPE: Respiratory protection.

CLEANING / DISINFECTIO: Control of *Legionella* growth can occur through chemical or thermal methods. Copper-silver ionization is a chemical process that disperses and destroys biofilms and slimes that can harbor *Legionella* over the long term. Hyperchlorination with chlorine dioxide or monochloramine is a similarly dispersive alternative treatment. Ultraviolet light, thermal eradication, and ozone are short-term (nondispersive) treatments.

Leptospirosis is a bacterial disease that affects humans and animals. It is caused by bacteria of the genus *Leptospira*. In humans it causes a wide range of symptoms, and some infected persons may have no symptoms at all. Symptoms of leptospirosis include high fever, severe headache, chills, muscle aches, and vomiting, and may include jaundice (yellow skin and eyes), red eyes, abdominal pain, diarrhea, or a rash. If the disease is not treated, the patient could develop kidney damage, meningitis (inflammation of the membrane around the brain and spinal cord), liver failure, and respiratory distress.

Comment [243]: Plagiarized from <http://en.wikipedia.org/wiki/Legionella>

Comment [244]: Plagiarized from <http://en.wikipedia.org/wiki/Legionella>, just farther down in the article.

Comment [245]: Plagiarized from <http://en.wikipedia.org/wiki/Legionella>

Comment [246]: Plagiarized from <http://www.cruise critic.com/news/news.cfm?ID=2127>, 2007, the source cites the CDC.

Comment [247]: Plagiarized from <http://en.wikipedia.org/wiki/Legionella>

In rare cases death occurs.

METHOD OF TRANSMISSION

Exposure to rodent urine, droppings, saliva, or nesting material of infected rodents. Virus transmission can also occur when these materials are directly introduced into broken skin or into the nose, eyes, or mouth or ingested from contaminated food.

OTHER HAZARDS: Dried feces will produce hazardous airborne dust that can be inhaled.

REGULATORY COMPLIANCE: none

PERSONAL PROTECTIVE EQUIPMENT: Latex or nitrile gloves and HEPA filtered respiratory protection as a minimum. Full protective suit recommended when cleaning an infestation.

VACCINATION/TREATMENT: No inoculation. Treatments include antibiotics and antiviral medications.

CLEANING/DISINFECTING: Vacuum up visible feces with a HEPA filtered unit. Soak all suspected contaminated areas with a hospital-grade disinfectant or one with specific kill claim for the target pathogen(s). Clean area and double-bag the collected waste material for disposal. Apply a final soaking of disinfectant on the cleaned surfaces and allow proper dwell time.

Listeria monocytogenes.

This is a Gram-positive bacterium, motile by means of flagella. Some studies suggest that 1-10% of humans may be intestinal carriers of *L. monocytogenes*. It has been found in at least 37 mammalian species (including humans), both domestic and feral, as well as at least 17 species of birds and possibly some species of fish and shellfish. It can be isolated from soil, silage, and other environmental sources. *L. monocytogenes* is quite hardy and resists the deleterious effects of freezing, drying, and heat remarkably well for a bacterium that does not form spores. According to Dr. Jay Glasel of the University of Connecticut Medical School, *Listeria* spp. can persist on dry surfaces up to 4 months.

DISEASE ASSOCIATED:

The manifestations of listeriosis include septicemia, meningitis (or meningoencephalitis), encephalitis, and intrauterine or cervical infections in pregnant women, which may result in spontaneous abortion (2nd/3rd trimester) or stillbirth. The onset of the aforementioned disorders is usually preceded by influenza-like symptoms including persistent fever. It was reported that gastrointestinal symptoms such as nausea, vomiting, and diarrhea may precede more serious forms of listeriosis or may be the only symptoms expressed.

METHOD OF TRANSMISSION: *L. monocytogenes* has been associated with such foods as raw milk, supposedly pasteurized fluid milk, cheeses (particularly soft-ripened varieties), ice cream, raw vegetables, fermented raw-meat sausages, raw and cooked poultry, raw meats (all types), and raw and smoked fish. Its ability to grow at temperatures as low as 3°C permits mul-

Comment [248]: Plagiarized from <http://www.odh.ohio.gov/pdf/idcm/1eptodfs.pdf>; the authors of this paper cite the CDC as the source (1999)

Comment [249]: Plagiarized from <http://foodsafety.ksu.edu/en/link-details.php?a=4&c=23&sc=196&id=155>, *Listeria monocytogenes* - Bad Bug Book - FDA 28.jun.05

Comment [250]: Plagiarized from http://www.kaivac.com/a_37-Bringing_Home_Something_Other_than_Homework_from_School_Microbial_Contamination_from_Highly_Touched_Objects

Comment [251]: Plagiarized from <http://foodsafety.ksu.edu/en/link-details.php?a=4&c=23&sc=196&id=155> *Listeria monocytogenes* - Bad Bug Book - FDA 28.jun.05

tiplication in refrigerated foods.

PPE: Latex or Nitrile Gloves. If the contamination is aerosolized, respiratory protection and protective suits are recommended.

INNOCULATION / TREATMENT

There is no inoculation, however antibiotics can be used to treat infection.

CLEANING / DISINFECTING

All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Lymphocytic Choriomeningitis Virus (LCMV) is an enveloped virus that is a member of the family Arenaviridae. It produces a viral infection with symptoms similar to the flu. Immunocompromised individuals have died from exposure to LCMV.

What is LCMV?

LCMV is carried by rodents and can be passed to humans. Not all people who are exposed to the virus become ill. Signs and symptoms of LCMV infection are similar to those for influenza and include fever, stiff neck, malaise, anorexia (lack of appetite), muscle aches, headache, nausea, and vomiting. Symptoms occur 1-2 weeks after exposure.

METHOD OF TRANSMISSION:

LCMV is naturally spread by the common house mouse, *Mus musculus*.^[5] Once infected, these mice can become chronically infected by maintaining virus in their blood and/or persistently shedding virus in their urine. Chronically infected female mice usually transmit infection to their offspring (vertical transmission), which in turn become chronically infected. Other modes of mouse-to-mouse transmission include nasal secretions, milk from infected dams, bites, and during social grooming within mouse communities. Airborne transmission also occurs.^[6]

The virus seems to be relatively resistant to drying and therefore humans can become infected by inhaling infectious aerosolized particles of rodent urine, feces, or saliva, by ingesting food contaminated with virus, by contamination of mucous membranes with infected body fluids, or by directly exposing cuts or other open wounds to virus-infected blood. The only documented cases of transmission from animals have occurred between humans and mice or hamsters.

Can other pets transmit LCMV to humans?

While it might be possible for other animals to become infected with the virus, documented infections in humans have occurred only after exposure to infected mice and hamsters. Human infections almost always occur from house mice and rarely occur from pet hamsters.

Comment [252]: Plagiarized from <http://foodsafety.ksu.edu/en/link-details.php?a=4&c=23&sc=196&id=155> Listeria monocytogenes - Bad Bug Book – FDA 28.jun.05

Comment [253]: Plagiarized from http://www.cdc.gov/healthypets/lcmv_rodents.htm, last update 2010

Comment [254]: The internet archive site, <http://archive.org/web/web.php>, makes it soooooo easy to find the exact Wikipedia page that Berg stole from. Plagiarized from http://web.archive.org/web/20100618170936/http://en.wikipedia.org/wiki/Lymphocytic_choriomeningitis

Comment [255]: Plagiarized from http://www.cdc.gov/healthypets/lcmv_rodents.htm

INNOCULATION / TREATMENT: There is no inoculation, and there is currently no LCMV-specific treatment for humans

PPE: Full barrier protection. Use respirators if aerosolization is suspected

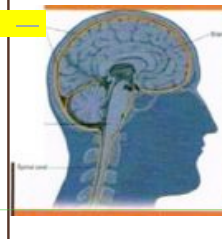
CLEANING / DISINFECTION: Pre-clean all contaminated surfaces, then apply the appropriate EPA-registered disinfectant

Meningitis is an inflammation of the protective membranes covering the brain and spinal cord.

Age group	Causes of meningitis
Neonates	Group B Streptococci, <i>Escherichia coli</i> , <i>Listeria monocytogenes</i>
Infants	<i>Neisseria meningitidis</i> , <i>Haemophilus influenzae</i> , <i>Streptococcus pneumoniae</i>
Children	<i>N. meningitidis</i> , <i>S. pneumomae</i>
Adults	<i>S. pneumomae</i> , <i>N. meningitidis</i> 's, Mycobacteria, Cryptococci

known collectively as the meninges. Meningitis may develop in response to a number of causes, most prominently microorganisms, such as viruses, bacteria, fungi, and other infectious agents, but also physical injury, cancer, or certain drugs that spread into the blood and into the cerebrospinal fluid. The most common cause of meningitis is viral, and often runs its course within a few days. Bacterial meningitis is the second most frequent type and can be serious and life-threatening. Numerous microorganisms may cause bacterial meningitis, but *Neisseria meningitidis* ("meningococcus") and *Streptococcus pneumoniae* ("pneumococcus") are the most common pathogens in patients without immune deficiency, with meningococcal disease being more common in children. *Staphylococcus aureus* may complicate neurosurgical operations, and *Listeria monocytogenes* is associated with poor nutritional state and alcoholism. *Haemophilus influenzae* (type B) incidence has been much reduced by immunization in many countries. *Mycobacterium tuberculosis* (the causative agent of tuberculosis) rarely causes meningitis in Western countries but is common and feared in countries where tuberculosis is endemic.

While some forms of meningitis are mild and resolve on their own, meningitis is a potentially serious condition due to the proximity of the inflammation to the brain and spinal cord. The potential for serious neurological damage or even death necessitates prompt medical attention and evaluation. Infectious meningitis, the most common form, is typically treated with antibiotics and requires close observation. Some forms of meningitis (such as those associated with meningococcus, mumps virus or pneumococcus infections) may be prevented with immunization.



Comment [256]: The internet archive "wayback machine" does it again. Maybe Berg thinks if he goes back far enough no one will find where/what he stole from. But, oh well, we did find it: Plagiarized from <http://web.archive.org/web/20080227161833/http://en.wikipedia.org/wiki/Meningitis>. Again, a mixture of deletions and reorganization but this is clearly the article that Berg stole and called his own.

Bacterial meningitis is spread through droplets of saliva when people sneeze, cough, kiss or share eating utensils, soda cans, water bottles or drinking glasses. Fortunately, none of the bacteria that cause meningitis are as contagious as things like the common cold or the flu, and they are not spread by casual contact or by simply breathing the air where a person with meningitis has been. Bacterial meningitis is prevalent where people are in close proximity for long periods of time. Grade school classrooms, military camps, and prisons are examples. People in the same household or day-care center, or anyone with direct contact with a patient's oral secretions (such as a boyfriend or girlfriend) would be considered at increased risk of acquiring the infection.

Outbreaks of meningitis are uncommon but very serious. When an outbreak occurs it is important to take quick action. Avoiding contact with the infected person and frequent hand washing are two important ways to reduce exposure to the agents of meningitis. It is believed that organisms that cause meningitis do not live long in the environment outside the body and it is highly unlikely that anyone would acquire meningitis by contacting an inanimate environmental surface. However, it is important to demonstrate to building occupants, visitors and the general public that prudent measures are being taken to prevent exposure. This can include special cleaning and disinfecting of key environmental surfaces using an EPA registered disinfectant.

Mycobacterium Tuberculosis. Tuberculosis or TB (short for tubercles bacillus) is a common and often deadly infectious disease caused by various strains of mycobacteria, usually *Mycobacterium tuberculosis* in humans. *Mycobacterium tuberculosis*, is a small aerobic non-motile, Gram+ bacillus. Tuberculosis usually attacks the lungs but can also affect other parts of the body. Most infections in humans result in an asymptomatic, latent infection, and about one in ten latent infections eventually progresses to active disease, which, if left untreated, kills more than 50% of its victims. *Mycobacterium tuberculosis*, the bacterium that causes tuberculosis, spreads in microscopic droplets that are released into the air when someone with the untreated active form of the disease coughs, speaks, laughs, sings or sneezes. These germs can float in the air for several hours, depending on the environment. Persons who breathe in the air containing these TB germs can become infected. Primarily an airborne disease, TB can survive for extended periods of time in the air and on various surface areas. It was found that 28 percent of the tuberculosis bacteria remains alive in a room after nine hours. Tuberculosis can live up to 45 days on clothing, 70 days in carpet, 90 to 120 days in dust, approximately 105 days on a paper book, and approximately six to eight months in sputum. Three things help kill off the tuberculosis bacteria: ultraviolet light, volume of air in a room and recirculation of air through a HEPA filter.

A person with nonresistant active TB who's been effectively treated for at least two weeks is generally no longer contagious. Rarely, a pregnant woman with an active TB disease may pass

Comment [257]: <http://www.coastwidelabs.com/Technical%20Articles/meningitis.htm>, Obviously the one that Berg plagiarized from. Reprint of this article here:

<http://webcache.googleusercontent.com/search?q=cache:LhGn3QecjWcl:s-wift.tahoma.wednet.edu/th/s/rbergum/archived-newsletters/download/ATTT-11-03.pdf%3Fid%3D44881+%&cd=4&hl=en&ct=clnk&gl=us&client=firefox-a>. You can download the pdf here: <http://swift.tahoma.wednet.edu/th/s/rbergum/archived-newsletters/download/ATTT-11-03.pdf?id=44881>.

Tahoma School District Custodial Staff Newsletter, November 1, 2003, "The following article was sent to us by Paul McTiernan of Coastwide Laboratories."

Comment [258]: Plagiarized from <http://web.archive.org/web/20100828174638/http://en.wikipedia.org/wiki/Tuberculosis> Web archive again.

Comment [259]: Mayo Clinic boilerplate info, found as earlier as 2003.

Comment [260]: Plagiarized from <http://webcache.googleusercontent.com/search?q=cache:MOP-wXVV0TgJ:www.radford.edu/content/student-affairs/home/student-health/health/tb-info.html+%&cd=2&hl=en&ct=clnk&gl=us&client=firefox-a>

Comment [261]: Plagiarized from, http://www.ehow.com/about_66429_29_lifespan-tuberculosis-droplets.html

the bacteria to her fetus.

TB is not spread by

- shaking someone's hand
- sharing food or drink
- touching bed linens or toilet seats
- sharing toothbrushes
- kissing

In the United States, cases of tuberculosis began declining steadily in the 1940s and 1950s mainly because of antibiotic therapy and improved public health programs. Yet the disease is still a serious health problem. Millions of Americans are infected with TB without having symptoms, and some of them will go on to develop active TB.

XDR Tuberculosis: Extensively drug-resistant tuberculosis (XDR TB) is a relatively rare type of multidrug-resistant tuberculosis (MDR TB). It is resistant to almost all drugs used to treat TB

including the two best first-line drugs: isoniazid and rifampin. XDR TB is also resistant to the best second-line medications: fluoroquinolones and at least one of three injectable drugs (i.e. amikacin, kanamycin or capreomycin). Because XDR TB is resistant to the most powerful first-line and second-line drugs, patients are left with treatment options that are much less effective and often have worse treatment outcomes.

METHOD OF TRANSMISSION: Airborne virus on aerosolized human sputum is inhaled into the lungs. When people suffering from active pulmonary TB cough, sneeze, speak, or spit, they expel infectious aerosol droplets 0.5 to 5 µm in diameter. A single sneeze can release up to 40,000 droplets. Each one of these droplets may transmit the disease, since the infectious dose of tuberculosis is very low and inhaling less than ten bacteria may cause an infection. People with prolonged, frequent, or intense contact are at particularly high risk of becoming infected, with an estimated 22% infection rate. A person with active but untreated tuberculosis can infect 10-15 other people per year.

INNOCULATION / TREATMENT: Treatment is difficult and requires long courses of multiple antibiotics. Antibiotic resistance is a growing problem in (extensively) multi-drug-resistant tuberculosis. Prevention relies on screening programs and vaccination, usually with Bacillus Calmette-Guérin vaccine.

PPE: Respiratory protection.

CLEAN! / DISINFECTION: Pre-clean contaminated area, then apply an EPA-registered

Comment [262]: Plagiarized from <http://tuberculosis-faqs.blogspot.com/2008/09/tuberculosis-causes.html>

Comment [263]: Plagiarized from <http://webcache.googleusercontent.com/search?q=cache:MOP-wXVV0TgJ:www.radford.edu/content/student-affairs/home/student-health/health/tb-info.html+&cd=2&hl=en&ct=clnk&gl=us&client=firefox-a>

Comment [264]: Plagiarized from <http://care.prajnopaya.org/index.php/resources/67-article-tuberculosis>, this article cites the Mayo Clinic Staff as the source for the article. The information came from a 2006 publication.

Comment [265]: Plagiarized from <http://web.archive.org/web/20110827150210/http://www.cdc.gov/tb/publications/factsheets/drtb/xdrtb.htm>, CDC information, available at least as far back 2009

Comment [266]: Plagiarized from <http://web.archive.org/web/20100828174638/http://en.wikipedia.org/wiki/Tuberculosis>

Comment [267]: Plagiarized from <http://web.archive.org/web/20110411040807/http://en.wikipedia.org/wiki/Tuberculosis>

list B high-level disinfectant with a label claim for Mycobacterium tuberculosis.

Norovirus (also known as Norwalk Virus or Norwalk-Like Virus - NLV) is a small round structured, non-enveloped virus that is a frequent cause of outbreaks of gastro-enteritis. Common settings include hospitals, schools, restaurants, hotels, nursing homes and cruise ships. Noroviruses are highly contagious and as few as 10 viral particles may be sufficient to infect an individual. Studies show that human noroviruses can latch onto a stainless steel surface within 10 minutes and survive for weeks. The CDC has estimated that 23 million cases of acute gastroenteritis and at least 50 percent of all food-borne illnesses can be attributed to noroviruses. NLVs are very hardy and can survive extreme temperature ranges from freezing to 140F.

METHOD OF TRANSMISSION: The viruses are spread by several routes: fecal-oral; vomit-oral/aerosols/ food and water. Persons who do not wash their hands after using the bathroom can easily transmit norovirus to food, phones, doorknobs, keyboards and virtually any surface you can imagine. Good evidence exists for transmission due to aerosolization of vomitus that presumably results in droplets contaminating surfaces or entering the oral mucosa and being swallowed. No evidence suggests that infection occurs through the respiratory system.

INNOCULATION / TREATMENT: There are currently no inoculations or treatments for norovirus.

PPE: Full PPE, full face respirator if disturbing settled virus on surfaces.

CLEANING / DISINFECTION: Clean all surfaces, with special attention to touchable surfaces such as hand rails, light switches, door handles, faucets, etc. Disinfect with a high-level disinfectant with a kill claim for the virus. Double-Bag all waste and all disposable cleaning supplies.

Pseudomonasaeruginosa: is a Gram-negative, aerobic, rod-shaped bacterium which can cause disease in humans and non-human animals. Although classified as an aerobic organism, *P. aeruginosa* is considered by many as a facultative anaerobe, as it is well adapted to proliferate in conditions of partial or total oxygen depletion. It is found in soil, water, skin flora,

NOTE: Norovirus is resistant to many disinfectants. A group of researchers from Laval University compared the efficacy of a variety of disinfectants and found that alcohol-based and ammonium-based products were least effective. Phenolics were effective but only in concentrations about three times higher than label instructions called for. Hypochlorites in concentrations of 5,000 – 10,000ppm (1:10, 1:5 dilutions respectively) were most effective. New products may have efficacy claims for Norovirus, but disinfectants that have claims for killing Feline Calicivirus may also be considered because this cat-borne virus is officially used by the EPA and FDA as a surrogate for testing disinfectants against norovirus. Pre-clean the contaminated area then apply the appropriate EPA-registered disinfectant with the appropriate label kill claim.

Comment [268]: Plagiarized from <http://www.virox.com/msds/pdf/norwalkandnorwalklikeprotocolforcanada.pdf>

Comment [269]: Plagiarized from <http://www.cbc.ca/news/bleach-best-to-beat-norovirus-study-1.935120> (March 17, 2010)

Comment [270]: Plagiarized from <http://diarrhea.emedtv.com/norovirus-gastroenteritis/norovirus-gastroenteritis-p4.html>, 2006

Comment [271]: Plagiarized from <http://www.virox.com/msds/pdf/norwalkandnorwalklikeprotocolforcanada.pdf>

and most man-made environments throughout the world. It thrives not only in normal atmospheres, but also in non-oxygenated atmospheres, and has thus colonized many natural and artificial environments. It uses a wide range of organic material for food; in animals, the versatility enables the organism to infect damaged tissues or people with reduced immunity. The symptoms of such infections are generalized inflammation and sepsis. If such colonizations occur in critical body organs such as the lungs, the urinary tract, and kidneys, the results can be fatal. Because it thrives on most surfaces, this bacterium is also found on and in medical equipment including catheters, causing cross infections in hospitals and clinics. It is implicated in hot-tub rash. Biofilms of *Pseudomonas aeruginosa* can cause chronic opportunistic infections while protecting these bacteria from adverse environmental factors. According to Dr. Jay Glasel of the University of Connecticut Medical School, *Pseudomonas aeruginosa* can persist on dry surfaces up to 5 weeks on a dry floor and up to 16 months on other dry surfaces.

METHOD OF TRANSMISSION: Contact with a contaminated surface.
PERSONAL PROTECTIVE EQUIPMENT: A minimum of gloves and faceshield.
INOCULATION / TREATMENT: Antibiotic treatment is meeting increasing resistance.
CLEANING / DISINFECTING: Clean all visibly contaminated surfaces using a disinfectant/bleacher. Thoroughly wet all surfaces with an EPA registered disinfectant with a label kill claim for the target pathogen, and allow proper dwell time.

SARS: Severe acute respiratory syndrome (SARS) is a viral respiratory illness caused by a coronavirus, called SARS-associated coronavirus (SARS-CoV) that can progress to a potentially fatal pneumonia. SARS was first reported in Asia in February 2003. Over the next few months, the illness spread to more than two dozen countries in North America, South America, Europe, and Asia before the SARS global outbreak of 2003 was contained.

Death occurs in about 9% of all cases. The death rate is higher among older persons. SARS is caused by a coronavirus, one of a group of viruses that are responsible for about one third of all cases of the common cold.

METHOD OF TRANSMISSION: The main way that SARS seems to spread is by close person-to-person contact. The virus that causes SARS is thought to be transmitted most readily by respiratory droplets (droplet spread) produced when an infected person coughs or sneezes. Droplet spread can happen when droplets from the cough or sneeze of an infected person are propelled a short distance (generally up to 3 feet) through the air and deposited on the mucous membranes of the mouth, nose, or eyes of persons who are nearby. The virus also can spread when a person touches a surface or object contaminated with infectious droplets and then touches his or her mouth, nose, or eye(s). In addition, it is possible that the SARS virus might spread more broadly through the air (airborne spread) or by other ways that are not now known.

What does "close contact" mean?

Comment [272]: Plagiarized from http://en.wikipedia.org/wiki/Pseudomonas_aeruginosa

Comment [273]: Plagiarized from http://www.kaivac.com/a_37-Bringing_Home_Something_Other_than_Homework_from_School_Microbial_Contamination_from_Highly_Touched_Objects

Comment [274]: Plagiarized from http://www.michigan.gov/documents/MDCH_SARS_Fact_Sheet_for_the_Public_83469_7.doc, 2003

Comment [275]: Boilerplate, found in many places

Comment [276]: Plagiarized from http://www.michigan.gov/documents/MDCH_SARS_Fact_Sheet_for_the_Public_83469_7.doc, 2003

In the context of SARS, close contact means having cared for or lived with someone with SARS or having direct contact with respiratory secretions or body fluids of a patient with SARS. Examples of close contact include kissing or hugging, sharing eating or drinking utensils, talking to someone within 3 feet, and touching someone directly. Close contact does not include activities like walking by a person or briefly sitting across a waiting room or office.

INNOCULATION / TREATMENT: There is no inoculation or treatment other than comfort-related care.

PPE: Full PPE with respiratory protection against aerosols.

CLEANING/DISINFECTION: Clean all surfaces, with special attention to touchable surfaces such as hand rails, light switches, door handles, faucets, etc. Disinfect with a high level disinfectant with a kill claim for the virus. Double-Bag all waste and all disposable cleaning supplies.

Salmonella is an aerobic, Gram- bacteria associated with exposure to contaminated food, such as poultry and poultry salads, meat and meat products, milk, shell eggs, egg custards and sauces, and other protein foods. Salmonellosis may also occur after contact with the feces of infected animals and humans. The bacteria can enter victims via the mouth, by inhalation, or through direct contact with open cuts or sores. The disease is also commonly associated with bird infestations. Acute food poisoning of this type is probably much more common than generally realized, and many involve a large number of persons at one time. The bacterium does not release toxins into the food in which it multiplies; rather, the ingested cells continue to multiply in the intestinal tract of the victim, causing illness. Most persons infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts 4 to 7 days and most persons recover without treatment. However, in some persons the diarrhea may be so severe that the patient needs to be hospitalized. In these patients the *Salmonella* infection may spread from the intestines to the blood stream, and then to other body sites and can cause death unless the person is treated promptly with antibiotics. The elderly, infants, and those with impaired immune systems are more likely to have a severe illness. According to Dr. Jay Glasel of the University of Connecticut Medical School, *Salmonella typhi* can persist up to 4 weeks on a dry surface, and *Salmonella typhimurium* can persist on dry surfaces up to 4.2 years.

METHOD OF TRANSMISSION: Contact with human or animal feces, or contaminated foods through ingestion, inhalation or open wounds.

INNOCULATION / TREATMENT: There is no inoculation. Salmonellosis is treated with antibiotics.

Comment [277]: Plagiarized from http://www.michigan.gov/documents/MDCH_SARS_Fact_Sheet_for_the_Public_83469_7.doc, 2003

Comment [278]: Plagiarized from chfs.ky.gov/NR/.../0/RegisteredSanitarianFieldHandbook712004.doc, (2004)

Comment [279]: Plagiarized from http://advancetechpc.com/index.php?page_id=32 (2010)

Comment [280]: Plagiarized from <http://www.cdc.gov/nczved/divisions/dfbmd/diseases/salmonellosis/>, 2009

Comment [281]: Plagiarized from http://www.kaivac.com/a_37-Bringing_Home_Something_Other_than_Homework_from_School_Microbial_Contamination_from_Highly_Touched_Objects

PPE: Gloves, faceshield, respiratory protection. Cover any wounds.

CLEANING / DISINFECTIO : Pre-clean contaminated surfaces. Apply an EPA-registered disinfectant with appropriate label kill claim.

Shigella. are Gram-negative nonmotile nonsporeforming rod-shaped bacteria. The illness caused by *Shigella*(*shigellosis*) accounts for less than 10% of the reported outbreaks of food-borne illness in this country. *Shigella* rarely occurs in animals; principally a disease of humans except other primates such as monkeys and chimpanzees. The organism is frequently found in water polluted with human feces. Flies are also thought to carry the bacteria. According to Dr. Jay Glasel of the University of Connecticut Medical School, *Shigella* spp. can persist on dry surfaces up to 5 months.

DISEASE ASSOCIATED: *Shigellosis* (bacillary dysentery). Infections are associated with mucosal ulceration, rectal bleeding, drastic dehydration; fatality may be as high as 10-15% with some strains.

METHOD OF TRANSMISSIO : Salads (potato, tuna, shrimp, macaroni, and chicken), raw vegetables, milk and dairy products, and poultry. Contamination of these foods is usually through the fecal-oral route. Fecally contaminated water and unsanitary handling by food handlers are the most common causes of contamination.

PPE: Latex or nitrile gloves. If the contamination is aerosolized, respiratory protection and protective suits are recommended.

INNOCULATION / TREATMENT: There is no inoculation, however antibiotics can be used to treat infection.

CLEANING / DISINFECTING: All surfaces are to be cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Staphylococcus aureus is a facultatively anaerobic, gram-positive coccus and is the most common cause of staph infections. It is frequently part of the skin flora found in the nose and on skin. About 20% of the human population are long-term carriers of *S. aureus*. Some strains of *S. aureus* also produce an enterotoxin that is the causative agent of foodborne illness. *S. aureus* grows in food, even under refrigeration. Staphylococcal intoxication is a fairly frequent cause of foodborne illness, with foods high in protein the usual culprits.

MRSA stands for Methicillin Resistant *Staphylococcus aureus*(*S. aureus*) bacteria. This organism is known for causing skin infections, in addition to many other types of infections. There

Comment [282]: Plagiarized from <http://www.seafoodhaccp.com/SeafoodData/BadBugBook/CHAP19.HTML>

Comment [283]: Plagiarized from http://www.kaivac.com/a_37-Bringing_Home_Something_Other_than_Homework_from_School_Microbial_Contamination_from_Highly_Touched_Objects

Comment [284]: Plagiarized from <http://www.seafoodhaccp.com/SeafoodData/BadBugBook/CHAP19.HTML>

are other designations in the scientific literature for these bacteria according to where the bacteria are acquired by patients, such as community-acquired MRSA (CA-MRSA), and hospital-acquired MRSA (HAMRSA) or epidemic MRSA (EMRSA)

Although *S. aureus* has been causing infections (staph infections) probably as long as the human race has existed, the MRSA strain has a relatively short history. MRSA was first noted in 1961, about two years after the antibiotic methicillin was initially used to treat *S. aureus* and other infectious bacteria. The resistance to methicillin was due to a penicillin-binding protein coded for by a mobile genetic element termed the methicillin resistant gene (*mecA*). In recent years, the gene has continued to evolve so that many MRSA strains are currently resistant to several different antibiotics. The USA300 group of strains appear to have extraordinary transmissibility and fitness and researchers anticipate it will evolve into various strains that will have a wide range of disease-causing potential in the future. *S. aureus* is sometimes termed a "superbug" because of its ability to become resistant to several antibiotics.

Most infections are skin related. However, a major problem with MRSA is that occasionally the skin infection can spread to almost any other organ in the body. When this happens, more severe symptoms develop. MRSA that spreads to internal organs can become life-threatening. Fever, chills, low blood pressure, joint pains, severe headaches, shortness of breath, and "rash over most of the body" are symptoms that need immediate medical attention, especially when associated with skin infections. The CDC estimates that MRSA effects 31.8 out of every 100,000 Americans, making it more common than flesh-eating streptococcus, bacterial pneumonia and meningitis combined, and more deadly than AIDS.

The ways people become infected with MRSA include physical contact with someone who is either infected or is a carrier (people who are not infected but are colonized with the bacteria on their body) of MRSA, or for people to physically contact MRSA on any objects such as door handles, floors, sinks, or towels that have been touched or sneezed on by an MRSA-infected person or carrier. According to officials at APIC, MRSA can survive on surfaces such as door knobs and hospital beds for 9 months. Recently, epidemiologists in Japan confirmed that MRSA could be acquired through airborne transmission. MRSA infects and replicates inside an amoeba species called *Acanthamoeba polyphaga*. This species is prevalent in the environment and is found in air, soil and water as well as on inanimate objects. Once inside the amoeba, MRSA replicates and can be shed by amoebal cysts. Researchers are concerned because these cysts, especially when dry, can become airborne and could spread MRSA.

Normal skin tissue in people usually does not allow MRSA infection to develop; however, if there are cuts, abrasions, or other skin flaws such as psoriasis (chronic skin disease with dry patches, redness, and scaly skin), MRSA may proliferate. Many otherwise healthy individuals, especially children and young adults, do not notice small skin imperfections or scrapes and ma

Comment [285]: Plagiarized from http://www.medicinenet.com/mrsa_infection/article.htm, this article, written by Charles Patrick Davis, MD, PhD, shows up at least as far back as 2007. Berg is a thief.

Comment [286]: Plagiarized from <http://www.cleanlink.com/sm/article/MRSA-A-Super-Problem--8105>, written by Nick Bragg, posted 2008. Berg merely deleted some information, and that is still plagiarism.

Comment [287]: Plagiarized from http://www.medicinenet.com/mrsa_infection/article.htm, this article, written by Charles Patrick Davis, MD, PhD, shows up at least as far back as 2007.

be lax in taking precautions about skin contacts. This is the likely reason MRSA outbreaks occur in diverse types of people such as school team players (like football players or wrestlers) dormitory residents and armed-services personnel in constant close contact. Sports figures like Peyton Manning, Tom Brady, Kellen Winslow have been affected by this disease. Brady has had three staph-infection-related procedures since his initial knee surgery. According to several reports UNC-Ashville's Kenny George, at 7-7 the nation's tallest college basketball player, had part of his foot amputated because of a staph infection.

METHOD OF TRANSMISSION: (1) Ingestion of contaminated food. (2) Infection through an open wound or unhealthy areas of skin due to psoriasis, pimple, etc.

INNOCULATION / TREATMENT: There is no inoculation. Treatment is by antibiotics and as described above, may require extensive treatments if the disease strain is drug-resistant.

PPE: Gloves, respiratory protection, eye protection, cover wounds. Full body protection is recommended.

CLEANING / DISINFECTION: All surfaces are to be pre-cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Toxoplasma gondii

Toxoplasmosis is one of the best known zoonotic diseases among physicians, veterinarians and the public. *Toxoplasma gondii* is a parasite often found in the feces of cats and humans. Normally producing only flu-like symptoms, it can be fatal to pregnant women and fetuses. Cats play an important role in the spread of toxoplasmosis. They become infected by eating infected rodents, birds, or other small animals. The parasite is then passed in the cat's feces in an oocyst form, which is microscopic. Kittens and cats can shed millions of oocysts in their feces for as long as 3 weeks after infection. People can accidentally swallow the oocyst form of the parasite after touching or ingesting anything that has come into contact with a cat's feces that contain *Toxoplasma*. In all hosts, the organism enters a chronic persistent phase following acute infection, and this persistence leads to the potential for reactivation of clinical disease at a later date (a particularly serious problem in AIDS patients).

METHOD OF TRANSMISSION: Hand-to-mouth transmission after touching infected cat feces.

PERSONAL PROTECTIVE EQUIPMENT: Latex or Nitrile gloves and a HEPA-filtered respirator is considered minimum equipment. Full protective suits are recommended for cleaning large areas or when dried feces could become airborne dust.

INNOCULATION / TREATMENT: Treatment is available.

Comment [288]: Plagiarized from http://www.medicinenet.com/mrsa_infection/article.htm, this article, written by Charles Patrick Davis, MD, PhD, shows up at least as far back as 2007., http://www.medicinenet.com/mrsa_infection/page4.htm

Comment [289]: Plagiarized from <http://www.patriotplanet.com/BB/archive/index.php/t-39278.html>

Comment [290]: Plagiarized from <http://www.vetmed.wisc.edu/pbs/zoonoses/toxo/toxindx.html>

Comment [291]: CDC boilerplate, found at least as early as 2010 on wayback machine, internet archives

Comment [292]: Plagiarized from <http://www.vetmed.wisc.edu/pbs/zoonoses/toxo/toxindx.html>

CLEANING / DISINFECTION: First, wet down the area with water (preferably with a wetting agent) or with a hospital-grade disinfectant. While wearing the appropriate PPE, clean up all feces, urine and potentially contaminated items. Physically clean all suspected contaminated surfaces. Apply a final application of hospital-grade disinfectant or 1:10 solution of bleach and allow proper dwell time. Double-bag waste and dispose. For large quantities, contact landfill for instructions on disposal.

Vibrio parahaemolyticus

A bacteria commonly found in fish and shellfish. *V. parahaemolyticus*-associated gastroenteritis is the name of the infection caused by this organism. Diarrhea, abdominal cramps, nausea, vomiting, headache, fever, and chills may be associated with infections caused by this organism. The illness is usually mild or moderate, although some cases may require hospitalization. The median duration of the illness is 2.5 days. The incubation period is 4-96 hours after the ingestion of the organism, with a mean of 15 hours. Disease is caused when the organism attaches itself to an individual's small intestine and excretes an as yet unidentified toxin.

METHOD OF TRANSMISSION:

Infections with this organism have been associated with the consumption of raw, improperly cooked, or cooked, recontaminated fish and shellfish. A correlation exists between the probability of infection and warmer months of the year. Improper refrigeration of seafoods contaminated with this organism will allow its proliferation, which increases the possibility of infection.

INOCULATION / TREATMENT: There is no inoculation. Treatment is with antibiotics.

PPE: Gloves

CLEANING / DISINFECTION: All surfaces are to be pre-cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Yersinia enterocolitica

Yersiniosis is an infectious disease caused by a bacterium of the genus *Yersinia*. In the United States, most human illness is caused by one species, *Y. enterocolitica* which belongs to a family of rod-shaped bacteria. Other species of bacteria in this family include *Y. pseudotuberculosis*, which causes an illness similar to *Y. enterocolitica* and *Y. pestis*, which causes plague. Only a few strains of *Y. enterocolitica* cause illness in humans. The major animal reservoir for *Y. enterocolitica* strains that cause human illness is pigs, but other strains are also found in many other animals including rodents, rabbits, sheep, cattle, horses, dogs, and cats. In pigs, the bacteria are most likely to be found on the tonsils.

Infection with *Y. enterocolitica* can cause a variety of symptoms depending on the age of the

Comment [293]: It's VIBRIO, not vabrio, by the way.

Comment [294]: Plagiarized from <http://www.seafoodhaccp.com/SeafoodData/BadBugBook/CHAP9.HTML> (1992)

person infected. Infection with *Y enterocolitica* occurs most often in young children. Common symptoms in children are fever, abdominal pain, and diarrhea, which is often bloody. Symptoms typically develop 4 to 7 days after exposure and may last 1 to 3 weeks or longer. In older children and adults, right-sided abdominal pain and fever may be the predominant symptoms and may be confused with appendicitis. In a small proportion of cases, complications such as skin rash, joint pains, or spread of bacteria to the bloodstream can occur.

METHOD OF TRANSMISSION: Infection is most often acquired by eating contaminated food, especially raw or undercooked pork products. The preparation of raw pork intestines (chitterlings) may be particularly risky. Infants can be infected if their caretakers handle raw chitterlings and then do not adequately clean their hands before handling the infant or the infant's toys, bottles, or pacifiers. Drinking contaminated unpasteurized milk or untreated water can also transmit the infection. Occasionally *Y enterocolitica* infection occurs after contact with infected animals. On rare occasions, it can be transmitted as a result of the bacterium passing from the stools or soiled fingers of one person to the mouth of another person. This may happen when basic hygiene and handwashing habits are inadequate. Rarely, the organism is transmitted through contaminated blood during a transfusion.

INOCULATION / TREATMENT: There is no inoculation. Many infections clear themselves, however, persistent infection requires extensive antibiotic treatment.

PPE: Gloves

CLEANING / DISINFECTION: All surfaces are to be pre-cleaned and disinfected with an EPA registered product rated for the target organism. Make sure the appropriate dwell time is observed.

Comment [295]: Plagiarized from http://www.cdc.gov/ncidod/dbmd/diseasesinfo/yersinia_g.htm; mixture of verbatim, deletions, and reorganization.

PATHOGENIC FUNGI

Alternaria is a genus of ascomycete fungi. *Alternaria* species are known as major plant pathogens. They are also common allergens in humans, growing indoors and causing hay fever or hypersensitivity reactions that sometimes lead to asthma. They readily cause opportunistic infections in immunocompromised people such as AIDS patients. There are 299 species in the genus. They are ubiquitous in the environment and are a natural part of fungal flora almost everywhere. They are normal agents of decay and decomposition. The spores are airborne and found in the soil and water, as well as indoors and on objects. The club-shaped spores are single or form long chains. They can grow thick colonies which are usually black or gray. At least 20% of agricultural spoilage is caused by *Alternaria* species. Many human health disorders can be caused by these fungi, which grow on skin and mucous membranes, including on the eyeballs and within the respiratory tract. Allergies are common, but serious infections are rare, except in people with compromised immune systems. However, species of this fungal genus are often prolific producers of a variety of toxic compounds. The effects most of these compounds have on animal and plant health are not well known. The terms *alternariosis* and *alternariotoxicosis* are used for disorders in humans and animals caused by a fungus in this genus.

Aspergillus species are highly aerobic and are found in almost all oxygen-rich environments where they commonly grow as molds on the surface of a substrate, as a result of the high oxygen tension. Commonly, fungi grow on carbon-rich substrates such as monosaccharides (such as glucose) and polysaccharides (such as amylose). *Aspergillus* species are common contaminants of starchy foods (such as bread and potatoes), and grow in or on many plants and trees. Some *Aspergillus* species cause serious disease in humans and animals. The most common causing pathogenic species are *Aspergillus fumigatus* and *Aspergillus flavus*. *Aspergillus flavus* produces aflatoxin which is both a toxin and a carcinogen and which can potentially contaminate foods such as nuts. The most common causing allergic disease are *Aspergillus fumigatus* and *Aspergillus clavatus*. Other species are important as agricultural pathogens. *Aspergillus* spp. cause disease on many grain crops especially maize, and synthesize mycotoxins including aflatoxin.

Pulmonary aspergillosis

Aspergillosis is the group of diseases caused by *Aspergillus*. The most common subtype among paranasal sinus infections associated with aspergillosis is *Aspergillus fumigatus*. The symptoms include fever, cough, chest pain or breathlessness, which also occur in many other illnesses so diagnosis can be difficult. Usually, only patients with already weakened immune sys-

Comment [296]: Plagiarized from from <http://web.archive.org/web/20100307195843/http://en.wikipedia.org/wiki/Alternaria>, (internet archive proves Berg's plagiarism again).

Stolen directly from wikipedia. The authors of the wiki entry at least had the decency to cite their sources, which are: Kirk PM, Cannon PF, Minter DW, Stalpers JA. (2008). Dictionary of the Fungi. 10th ed. Wallingford: CABI. p. 22. ISBN 0-85199-826-7, Nowicki, Marcin et al. *Alternaria* black spot of crucifers: Symptoms, importance of disease, and perspectives of resistance breeding, Vegetable Crops Research Bulletin, Versita, Warsaw, Poland, retrieved 2012-09-01

terns or who suffer other lung conditions are susceptible.

In humans, the major forms of disease are

- *Allergic bronchopulmonary aspergillosis* or *ABPA*, which affects patients with respiratory diseases like asthma, cystic fibrosis, and sinusitis).
- *Acute invasive aspergillosis*, a form that grows into surrounding tissue, more common in those with weakened immune systems such as AIDS or chemotherapy patients.
- *Disseminated invasive aspergillosis*, an infection spread widely through the body.
- *Aspergilloma*, a "fungus ball" that can form within cavities such as the lung.

Cladosporium is a genus of fungi including some of the most common indoor and outdoor molds. Species produce olive-green to brown or black colonies, and have dark-pigmented conidia that are formed in simple or branching chains. The many species of *Cladosporium* are commonly found on living and dead plant material. Some species are plant pathogens, others parasitize other fungi. *Cladosporium* spores are wind-dispersed and they are often extremely abundant in outdoor air. Indoors *Cladosporium* species may grow on surfaces when moisture is present. *Cladosporium* species are rarely pathogenic to humans, but have been reported to cause infections of the skin and toenails, as well as sinusitis and pulmonary infections. If left untreated, these infections could turn into respiratory infections like pneumonia.

The airborne spores of *Cladosporium* species are significant allergens, and in large amounts they can severely affect asthmatics and people with respiratory diseases. Prolonged exposure may weaken the immune system. *Cladosporium* species produce no major mycotoxins of concern, but do produce volatile organic compounds (VOCs) associated with odors.

Fusarium is a large genus of filamentous fungi widely distributed in soil and in association with plants. Most species are harmless saprobes and are relatively abundant members of the soil microbial community. Some species produce mycotoxins in cereal crops that can affect human and animal health if they enter the food chain. The main toxins produced by these *Fusarium* species are fumonisins and trichothecenes. Some species may cause a range of opportunistic infections in humans. In humans with normal immune systems, fusarial infections may occur in the nails (onychomycosis) and in the cornea (keratomycosis or mycotic keratitis). In humans whose immune systems are weakened in a particular way (neutropenia, i.e., very low count of the white blood cell type called neutrophils), aggressive fusarial infections penetrating the entire body and bloodstream (disseminated infections) may be caused by members of the *Fusarium solani* complex, *Fusarium oxysporum*, *Fusarium verticillioides*, *Fusarium proliferatum* and rarely other fusarial species.

Comment [297]: Do we really have to tell you that this is plagiarism? Berg didn't write 90% of this book. But here goes anyway, plagiarized from <http://web.archive.org/web/20090107190512/http://en.wikipedia.org/wiki/Aspergillus>.

Comment [298]: Plagiarized from <http://web.archive.org/web/20090218194229/http://en.wikipedia.org/wiki/Cladosporium>

Comment [299]: Plagiarized from <http://web.archive.org/web/20090209183808/http://en.wikipedia.org/wiki/Fusarium>

Geotrichum is a yeast found worldwide in soil, water, air, and sewage, as well as in plants, cereals, and dairy products. *Geotrichum* strains produce rapidly growing, white, dry, powdery to cottony colonies, resembling "ground glass." When disturbed on the surface, the colony becomes yeast-like or slimy. The optimal growth temperature is 25°C. Most strains either do not grow at all or grow weakly at 37°C. It is also found in normal human flora and is isolated from sputum and feces. The genus *Geotrichum* includes several species. The most common one is *Geotrichum candidum*. *Geotrichum clavatum* and *Geotrichum fici* are among other *Geotrichum* species. As well as being a colonizer of the intestinal tract, *Geotrichum* spp. may cause opportunistic infections in immunocompromised host and these infections are referred to as geotrichosis. The infections are usually acquired via ingestion or inhalation. Bronchial and pulmonary as well as disseminated infections and fungemia due to *Geotrichum* have been reported. It has also been isolated from infections resulting from trauma.

Comment [300]: Plagiarized from <http://www.doctorfungus.org/thefungi/Geotrichum.php>

Penicillium are ubiquitous soil fungi preferring cool and moderate climates, commonly present wherever organic material is available. Saprophytic species of *Penicillium* live mainly on organic biodegradable substances. Commonly found in soil, food, cellulose and grains, it is also found in paint and compost piles. It is also commonly found in carpet, wall paper, and in organic substances inside interior fiberglass duct insulation. This organism causes food spoilage, colonizes leather objects and is an indicator organism for dampness indoors. Some species have a blue color, commonly growing on old bread and giving it a blue fuzzy texture. Some species can produce mycotoxins which are a common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchi spasms, chronic cases may develop pulmonary emphysema. Many patients complain of a suffocating or gasping sensation when suffering from the effects of penicillium toxicity. It has also been implicated in causing allergic reactions, hypersensitivity pneumonitis, and a variety of severe lung complications. It may cause sarcoidosis, fibrosis, or allergic alveolitis in susceptible individuals, or patients who have been exposed over long periods of time, depending on the strain.

Comment [301]: Plagiarized from <http://web.archive.org/web/20100227105438/http://en.wikipedia.org/wiki/Penicillium>

Comment [302]: Plagiarized from <http://www.mold-help.org/content/view/424/> (2004)

Comment [303]: Plagiarized from <http://web.archive.org/web/20100227105438/http://en.wikipedia.org/wiki/Penicillium>

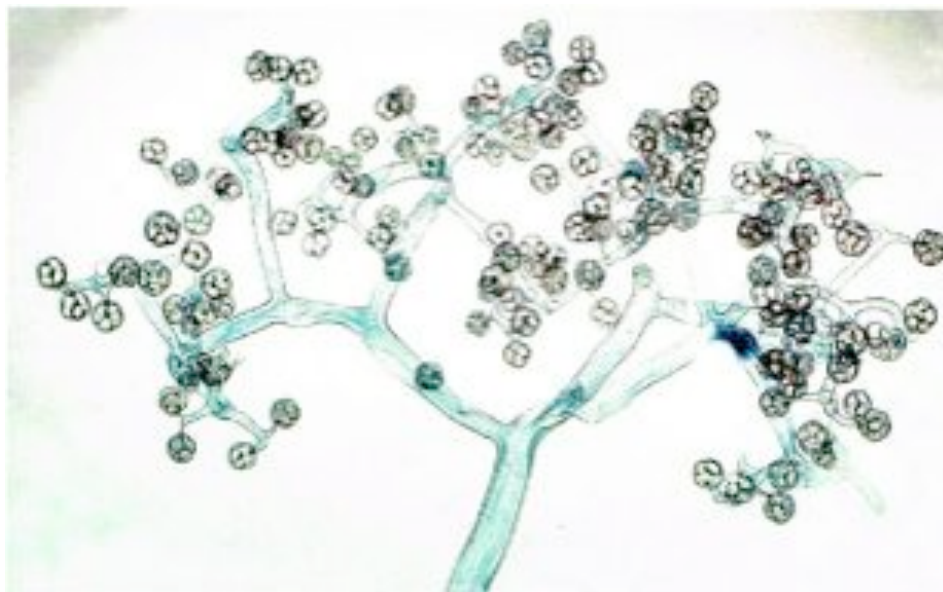
Penicillium Aurantiogriseum produces mycotoxins that when ingested or inhaled in large quantities, can cause considerable harm to humans and other mammals. As with all toxigenic fungi, exposure to penicillium does alter human DNA and can cause permanent neurological, pathological, immunological and psychological damage. *Penicillium mameffi* produces many serious infections that can be focal or disseminated that can affect the bone marrow, kidneys, lungs, intestines, liver, spleen, skin, and soft tissue. The clinical manifestations most commonly associated with *Penicillium mameffi* are fever, weight loss, anemia, skin lesions, cough, hepatomegaly, adenopathies, and pulmonary infiltrates. Apparently, several points of entry are possible for *Penicillium mameffi*. The skin, inhalation, and all points of the digestion tract.

Comment [304]: Plagiarized from <http://www.mold-help.org/content/view/424/> 2004

Rhizopus Mucoraceae are ubiquitous fungi that are commonly found in soil and in decaying matter. *Rhizopus* can be found in moldy bread. Given the ubiquitous nature of these fungi, most humans are exposed to these organisms on a daily or weekly basis. Nonetheless, they rarely cause disease because of the low virulence of the organisms and mainly affect individuals with immunocompromising conditions. Immunocompromised hosts with poorly controlled diabetes who have undergone transplantation, who have iron overload, have sustained traumatic injury or who have burns are at risk for disease. The major route of infection is via inhalation; other routes include ingestion and traumatic inoculation. For instance, nonsterile tape and contaminated wooden splints have caused wound infections. Such cases are associated with trauma, the presence of a pre-existing wound, or both. When spores are deposited in the nasal turbinates, rhinocerebral disease develops. When spores are inhaled into the lungs, pulmonary disease develops. When the agents are introduced through abraded skin, cutaneous disease develops. Ingestion leads to Gastro-Intestinal disease, primarily among malnourished persons.

Comment [305]: Plagiarized from <http://www.journals.elsevierhealth.com/periodicals/ymge/article/S0016-5107%2808%2900347-7/abstract>

Comment [306]: Plagiarized from <http://misc.medscape.com/pi/iphone/medscapeapp/html/A222551-business.html>



CHAPTER
17
Glossary

Glossary:

Aerobe - An organism, especially a bacterium, requiring oxygen to live.

Anaerobe - An organism, especially a bacterium, not requiring oxygen or free oxygen to live.

Antibodies - (also known as immunoglobulins) are gamma globulin proteins that are found in blood or other bodily fluids of vertebrates, and are used by the immune system to identify and neutralize foreign objects, such as bacteria and viruses.

Binary fission - The process by which bacteria reproduce (nonsexual reproduction), dividing in two under ideal conditions.

Chelating Agents - Chemicals that combine with metal ions and remove them from their sphere of action, also called sequestrants. They are used in food manufacture to remove traces of metal ions which might otherwise cause foods to deteriorate and clinically to reduce absorption of a mineral, or to increase its excretion.

Colony - A cluster of microorganisms that is growing within, or on the surface of, a nutrient medium and that contains millions of bacteria cells.

Contraindicated - is a condition or factor that serves as a reason to withhold a certain medical treatment.

Enveloped viruses - Many viruses (e.g. influenza and many animal viruses) have viral envelopes covering their protein capsids. Functionally, viral envelopes are used to help viruses enter host cells. The viral envelope fuses with the host's membrane, allowing the capsid and viral genome to enter and infect the host. The lipid envelope of these viruses is relatively sensitive to disinfectants, therefore these viruses are easier to kill than non-enveloped viruses, have limited survival outside host environments, and typically must transfer directly from host to host.

Efficacy - Power or capacity to produce a desired effect; effectiveness

Excystation - Removal from a cyst; denoting the action of certain encysted organisms in escaping from their envelope.

Facultative - Able to grow either with or without the presence of free oxygen.

Fomite - a term for any inanimate object that can serve as a home for microbes, and transfer disease-causing organisms to living hosts. Your desk, your tools, and even your pen are all fomites. Very few things we encounter in our everyday activities are sterile, or microbe-free. You are most likely to find microbes in and on dark, moist objects that frequently come into contact with food, dirt or vegetation.

In vivo - occurring or made to occur within a living organism or natural setting.

Macrophage - A type of white blood cell that ingests (takes in) foreign material. Macrophages are key players in the immune response to foreign invaders such as infectious microorganisms.

Oocysts - A thick-walled structure in which new offspring develop and that serves to transfer them to new hosts.

Outbreak - the occurrence of a large number of cases of a disease in a short period of time.

Pandemic - an epidemic that affects multiple geographic areas at the same time.

Parasite - an animal or plant that lives in or on another, and from which it obtains nourishment.

Pathogen - any disease-causing agent; i.e. virus, bacteria or other microorganisms.

Comment [307]:

Generic glossary - Berg didn't write any of these definitions.

Protease – any enzyme that catalyzes the splitting of interior peptide bonds in a protein.

Protein – any of a group of complex organic compounds which contain carbon, hydrogen, oxygen, nitrogen and usually sulfur, characteristic element being nitrogen; widely distributed in plants and animals.

Protozoan- protozoa are one-celled microscopic members of the animal kingdom. They do breathe, move, and reproduce like multicelled animals. They live in water or at least where it is damp. Animals in this group include the paramecium, the euglena and the amoeba.

Reservoir host – a host that carries a pathogen without injury to itself and serves as a source of infection for other host organisms.

Retrovirus- an RNA virus that is replicated in a host cell via the enzyme reverse transcriptase to produce DNA from its RNA genome. The DNA is then incorporated into the host's genome by an integrase enzyme. The virus thereafter replicates as part of the host cell's DNA. Retroviruses are enveloped viruses that belong to the viral family *Retroviridae*.

RNA (ribonucleic acid) – a nucleic acid that governs protein synthesis in a cell.

Saponify - form soap

Spore- A stage at which some rod-shaped bacteria develop a thickened capsule that allows them to tolerate heat, extreme cold, high salt conditions, drying, and high acid conditions.

Toxin- A poison produced by a living microorganism.

Vaccine- a biological preparation that improves immunity to a particular disease. A vaccine typically contains an agent that resembles a disease-causing microorganism, and is often made from weakened or killed forms of the microbe or its toxins. The agent stimulates the body's immune system to recognize the agent as foreign, destroy it, and "remember" it, so that the immune system can more easily recognize and destroy any of these microorganisms that it later encounters.

Comment [308]:

End of glossary Berg didn't write.

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ABOUT THE AUTHOR

SUMMARY:

Since 1996, Kent has been dedicated to the research and practical application of cleaning and disinfection practices for the international industry that provides cleanup and disinfection of biological health hazards. Prior to that time, he has spent over twenty years in government public safety, including over twelve years of public safety management. His private Sector entrepreneurship includes the creation and successful operation of several businesses and the creation of a patented medical resuscitator. Civic responsibility includes serving as the president of an international non-profit organization, serving three consecutive terms as a County commissioner, and sitting on several public service committees.

CEO OF BIOCARE INC.

In 2001 BioCare was contracted by the U.S. Government to decontaminate a postal facility within the Veterans Medical Center in Washington, DC that was contaminated with anthrax, and following hurricane Katrina, BioCare cleaned scenes in New Orleans after decomposing bodies were removed. His company has also performed Cruise Ship decontamination for Norovirus, and MRSA disinfection.

DIRECTOR OF THE NATIONAL INSTITUTE OF DECONTAMINATION SPECIALISTS (NIDS)

NIDS teaches specialty decontamination, ie. crime scenes, meth labs, disease outbreaks, and other unusual challenges. Kent has personally trained over 250 companies across the U.S., Canada, Australia, and the U.K., and has provided countless others with technical assistance. Cities, Counties and the military have prepared bid requests for biorecovery services through consultation with Mr. Berg.

OPERATIONS COORDINATOR, GREENVILLE COUNTY EMERGENCY MEDICAL SERVICES

From 1983 to 2000, Kent rose in rank and responsibility, culminating in the supervising of the daily operations of 126 full-time employees and 28 emergency vehicles. Subordinates included four field Lieutenants, one Logistics Coordinator, one Dispatch Lieutenant, fourteen dispatchers, twelve Rescue Sergeants, fourteen Station Chiefs, and 80 Paramedics. In his administrative capacity, he helped prepare the \$6M annual budget, served as the Mutual Aid Coordinator and applied for federal grant monies. In his operations capacity, he served as the mass casualty and disaster liaison with the County Emergency Preparedness Division. Over the course of 17 years, Kent served in a variety of capacities, including: Paramedic, Field Lieutenant on Heavy Rescue Teams, Shift Captain – responsible for 20 paramedic personnel on B Shift; Logistics Coordinator – in charge of supplies and equipment, all bid preparations and review, as well as annual supply budget, and served as HAZMAT medical coordinator. He investigated all accidents and incidents, served as the public liaison in conflict resolution, media liaison (often appearing on local news), and issued disciplinary actions as well as commendations. During his time with Greenville County EMS, it was selected as National EMS System of the year, and he was selected an unprecedented

three times as employee of the year.

TISSUE RECOVERY COORDINATOR, LIFEPOINT

Assigned to the Upstate South Carolina office, Kent served on the tissue recovery surgical team which harvested human organs and tissue for transplant. His position on the surgical team was to perform surgical procurements of whole globe eyes, corneas, tissue, tendons, bones, joints and more in the operating suites of hospitals using accepted surgical sterile techniques.

FORMAL EDUCATION:

Business Management Major 3.9 GPA
Greenville Community College 1987-1989

OTHER EDUCATION AND CERTIFICATIONS:

South Carolina Advanced EMT (Paramedic) Fluent in endotracheal intubation, intravenous therapy, cardiac defibrillation /cardioversion, 12-lead EKG interpretation, pharmacological therapies, and trauma care. In-service training included certifications in neonatal care, ACLS, PHTLS, and PALS. Certification has expired.

Certified Emergency Vehicle Operations Course Instructor. Taught high-speed evasive maneuvers, accident avoidance, and vehicle control in slides to emergency personnel driving automobiles, ambulances, and heavy rescue trucks.

Federal Law Enforcement Training. Police Academy Class 284 at the Federal Law Enforcement Training Center in Brunswick, Georgia. Course included police procedure, criminal law, investigative techniques, crime scene photography, fingerprinting, arrest procedures, self-defense, high-speed pursuit, lethal & non-lethal weapons proficiency and legal documentation. Graduated in top 4% of class.

HazMat, Hazwoper Technician. Training includes identification, mitigation, and remediation of hazardous material releases through the use of tools, personal protective equipment, respirators, neutralization chemicals, control devices, and storage containers. (Also served as County HAZMAT team medical coordinator)

BioRecovery Technician Instructor. BioRecovery is the industry responsible for the cleanup and decontamination of biological hazards. Course content includes microbiology, disease, personal protective equipment, federal regulatory compliance, equipment use, cleaning and antimicrobial chemicals, efficacy of disinfectant types, containment, decomposition deodorization, specialty devices, pad aging of waste, crime scene preservation, post traumatic stress, documentation, and photography.

Bloodborne Pathogen Training Instructor. Course includes employer obligations, disease processes, methods of disease transmission, common bloodborne diseases, personal pro-

ective equipment, engineering controls, principles of disinfection, packaging of infectious waste, inoculation benefits, safety precautions, injury reporting and medical follow-up care

Certified Respirator Trainer. Trained and Certified by the 3M company to educate students about the design, proper use, benefits, dangers, inspection, cleaning, storage, and fit testing of various types of negative and positive-pressure respirators including filtering facepiece, elastomeric half and full-face respirators, and masked and hooded powered air purifying respirators.

Microbial Remediation Technician. Certified by Restoration Consultants of California. Trained in the recognition, mitigation and remediation of contaminated indoor environments. Topics included microbiology, commonly found bacteria and fungi, health hazards, moisture mitigation, containment, eradication, antimicrobials, pre and post air/surface sampling, and documentation.

Radiological Monitoring. Certificate and class from the South Carolina Emergency Management Division. Course included classes of radiation, radiation scenarios, health hazards of radiation, protection factors, detection devices and their operation, and the interpretation of those instrument readings.

Clandestine Drug Lab Decontamination Specialist Instructor. Trained by Michael Miller, DEA instructor, and Charlie King, CLANLAB decon specialist. Course included history of various illegal drugs, lab recognition, types of manufacturing methods and their hazards, use of Photo-Ionization Detection instruments, gas vapor monitors, air/surface/well/groundwater/septic sampling, lab analysis, booby-traps, personal protective equipment, decontamination, packaging, disposal, and documentation.

Incident Command Instructor. Phoenix Fire Department, AZ. Incident Command is a concept that facilitates control and coordination of multiple agencies or groups as they work toward a common goal of accomplishing a specific mission, usually for the protection of life, property, or the environment. Course includes history and description of incident command, concepts and principles, major components, implementation, command procedures, command structure, divisions, groups/sectors, logistical materials, and documentation.

Media Relations. Course included the five "w's", preparation, handling a news conference, developing a sound working relationship with the media, reactive vs. proactive, the interviewing process, and mock media interviews.

Weapons of Mass Destruction Training.

- Emergency Response to Terrorism - FEMA/SCEPD
- Disaster Management Training - FEMA
- Weapons of Mass Destruction Class - SC Fire Academy
- Emergency Management Conference on Terrorism - SCEMA
- Toxicology of Chemical Warfare Agents - EPA
- Int'l Conference on Biological and Chemical Terrorism - Dept of State
- WMD Response - Center for Domestic Preparedness
- Response to Suicide Bombing Incidents - New Mexico Tech

Forensic Chemical Recognition and Safety. Las Vegas Metro Police Crime Lab. Course included recognition of the various types of crime scene investigative chemicals, their application and use, and the hazards associated with each.

Foreign Animal Disease /Ag-Terrorism Instructor. Trained through KirRwood Community College through a grant from the Dept. of Agriculture – APHIS. Course includes all phases of handling outbreaks including containment, euthanasia, disposal, and disinfection.

OTHER NOTEWORTHY ACCOMPLISHMENTS:

Founder, Past President, Current Board Member of the American BioRecovery Association. ABRA is an international non-profit trade group representing the biological decontamination industry. ABRA represents crime scene cleanup and disease outbreak remediation firms in the U.S., Canada, England and Australia. ABRA was formed in 1996 and is recognized by the U.S. government agency NIOSH as the foremost authority on crime scene clean-up/decontamination. Annual conferences are held throughout the U.S., and feature speakers from various applied disciplines.

Inventor of the Berg Resuscitation Apparatus. This is a medical resuscitator adjunct device designed to be used by paramedics and emergency medical technicians. The advantage of the device is that it allows two-person CPR to be performed by only one person. Used in situations where personnel are scarce, superior care can be given with a much higher probability of lives saved. The device was reviewed by the FDA and given approval, and evaluated by some of the top pre-hospital device evaluators in the country. It was favorably written up in medical journals and given the "thumbs-up" by Dr. Peter Safar, the Nobel Prize winning physician attributed with the invention of modern-day CPR. Device was sold to rescue squads, EMS agencies and U.S. Navy.

Author of *two* books. In response to a need to standardize the training of BioRecovery Technicians, Mr. Berg researched and wrote the "Crime and Trauma Scene BioRecovery Technical Manual" and the "Clandestine Drug Lab Residue Decontamination Manual,,". Both manuals are composed of over 200 pages each. The technical manuals are professionally bound and contain over 100 color diagrams and photographs. The crime scene manual is now the official textbook for the national biorecovery technician certification class given by the American BioRecovery Association in the U.S. and Canada; has been adopted as the standard for training in Queensland Australia, and is considered the standard reference around the world.

Freelance Writer for ICS and R&R journals. Articles expound on the administrative and technical aspects of biological remediation outside of the healthcare environment.

Chairman of the IICRC Committee for Crime Scene Cleanup Standards. Mr. Berg was recently honored to be invited by the IICRC to chair the standards committee. The IICRC is recognized as the international standards setting organization in the cleaning and restoration industries.

CIVIC DUTY:

Former Safety Committee member of the Greenville County School District. Helped write the emergency/disaster plan for the County school system, and taught teachers and principals how to deal with injuries and illnesses occurring at school.

Former Member of the Greenville Safe Communities Program. Participated in various projects to encourage and ensure the safety of the county residents. Programs included child safety-seat checks, railroad crossing safety programs, Halloween safety, and child safety day.

Former Member of the Greenville County DUI Task Force. Participated in media campaigns to reduce accidents and fatalities related to intoxicated drivers. Put on reenactments of crashes and their aftermath to teens and others convicted of first offense DUI.

Former Chairman of the Anderson County EMS commission. Served for three consecutive terms overseeing the planning, contracting, and compliance of eight ambulance/rescue services under contract to provide Emergency Medical Services to the citizens and guests of Anderson County. Presided over the commission meetings, evaluated proposals and contracts, represented the commission at County Council meetings.

Amateur Radio Operator. Currently holds a Technician level amateur radio license (KB4CSI) which permits the operation of high-powered two-way radio equipment on a variety of short, medium, and long-range frequencies. Amateur radio has regularly played an important role in maintaining communications during disasters when other forms of communication (including public safety) fail.

MEDIA AND SPEAKING ENGAGEMENTS

Author of articles for Criminal Justice Magazine, Cleanfax Magazine, Remediation & Restoration Magazine, Bio-Graph Newsletter, ICS.

Featured speaker at the Restoration Industry Association (RIA) Conference in San Diego on Crime & Trauma Scene BioRecovery -2007, Speaker at South Carolina Board of Realtors.

Featured Speaker at the "Connections" restoration conference in Clearwater, FL 2010

Teach 14 classes per year. Students have come from as far away as New Zealand, UK, Canada, Australia, and Belgium.

Special Segments on crime scene cleanup with ABC, NBC and FOX affiliates.

Quoted in newspapers: NY Times, Chicago Tribune, LA Times, and dozens of local papers.

MEMBERSHIP :

American BioRecovery Association, Association for Professionals in Infection Control and Epidemiology, International Association of Hazardous Materials Technicians, National Environmental Health Association.

When in South Carolina, please stop by our training facility for a tour, our just to say "hi". If you would like more information on the National Institute of Decontamination Specialists' training programs, visit us on the web at www.NIDStraining.com.

The FraudOut Team deleted photos of Berg's Training Center on this page.

