THE OFFICIAL
PATIENT'S SOURCEBOOK
on

VIBRIO VULNIFICUS INFECTION

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Dedication

To the healthcare professionals dedicating their time and efforts to the study of Vibrio vulnificus infection.

Acknowledgements

The collective knowledge generated from academic and applied research summarized in various references has been critical in the creation of this sourcebook which is best viewed as a comprehensive compilation and collection of information prepared by various official agencies which directly or indirectly are dedicated to Vibrio vulnificus infection. All of the *Official Patient's Sourcebooks* draw from various agencies and institutions associated with the United States Department of Health and Human Services, and in particular, the Office of the Secretary of Health and Human Services (OS), the Administration for Children and Families (ACF), the Administration on Aging (AOA), the Agency for Healthcare Research and Quality (AHRQ), the Agency for Toxic Substances and Disease Registry (ATSDR), the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), the Healthcare Financing Administration (HCFA), the Health Resources and Services Administration (HRSA), the Indian Health Service (IHS), the institutions of the National Institutes of Health (NIH), the Program Support Center (PSC), and the Substance Abuse and Mental Health Services Administration (SAMHSA). In addition to these sources, information gathered from the National Library of Medicine, the United States Patent Office, the European Union, and their related organizations has been invaluable in the creation of this sourcebook. Some of the work represented was financially supported by the Research and Development Committee at INSEAD. This support is gratefully acknowledged. Finally, special thanks are owed to Tiffany LaRochelle for her excellent editorial support.

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About ICON Health Publications

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- The Official Patient's Sourcebook on Anthrax
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- The Official Patient's Sourcebook on Botulism
- The Official Patient's Sourcebook on Brainerd Diarrhea
- The Official Patient's Sourcebook on Brucellosis
- The Official Patient's Sourcebook on Campylobacteriosis
- The Official Patient's Sourcebook on Chlamydia Pneumonia
- The Official Patient's Sourcebook on Cholera
- The Official Patient's Sourcebook on Coccidioidomycosis
- The Official Patient's Sourcebook on Cryptococcosis
- The Official Patient's Sourcebook on Diarrheagenic Escherichia Coli
- The Official Patient's Sourcebook on Diphtheria
- The Official Patient's Sourcebook on Drug-resistant Streptococcus Pneumoniae
- The Official Patient's Sourcebook on Enterotoxigenic E. Coli
- The Official Patient's Sourcebook on Escherichia Coli
- The Official Patient's Sourcebook on Food Irradiation
- The Official Patient's Sourcebook on Foodborne Disease
- The Official Patient's Sourcebook on Genital Candidiasis
- The Official Patient's Sourcebook on Glanders
- The Official Patient's Sourcebook on Group A Streptococcus
- The Official Patient's Sourcebook on Group B Streptococcus
- The Official Patient's Sourcebook on Haemophilus Influenzae Serotype B
- The Official Patient's Sourcebook on Hansen's Disease
- The Official Patient's Sourcebook on Helicobacter Pylori Infections
- The Official Patient's Sourcebook on Histoplasmosis
- The Official Patient's Sourcebook on Invasive Candidiasis
- The Official Patient's Sourcebook on Legionellosis
- The Official Patient's Sourcebook on Leptospirosis
- The Official Patient's Sourcebook on Leptospirosis Infection in Pets
- The Official Patient's Sourcebook on Listeriosis
- The Official Patient's Sourcebook on Melioidosis
- The Official Patient's Sourcebook on Meningitis
- The Official Patient's Sourcebook on Mycobacterium Avium Complex

- The Official Patient's Sourcebook on Mycoplasma Pneumoniae
- The Official Patient's Sourcebook on Nocardiosis
- The Official Patient's Sourcebook on Oropharyngeal Candidiasis
- The Official Patient's Sourcebook on Other Mycobacterium Species
- The Official Patient's Sourcebook on Pertussis
- The Official Patient's Sourcebook on Pneumonia among Children in Developing Countries
- The Official Patient's Sourcebook on Psittacosis
- The Official Patient's Sourcebook on Salmonella Enteritidis Infection
- The Official Patient's Sourcebook on Salmonellosis
- The Official Patient's Sourcebook on Shigellosis
- The Official Patient's Sourcebook on Sporotrichosis
- The Official Patient's Sourcebook on Streptococcus Pneumoniae Disease
- The Official Patient's Sourcebook on Toxic Shock Syndrome
- The Official Patient's Sourcebook on Trachoma
- The Official Patient's Sourcebook on Travelers Diarrhea
- The Official Patient's Sourcebook on Typhoid Fever
- The Official Patient's Sourcebook on Unexplained Deaths & Critical Illnesses
- The Official Patient's Sourcebook on Urinary Tract Infections
- The Official Patient's Sourcebook on Vibrio Parahaemolyticus
- The Official Patient's Sourcebook on Yersiniosis

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INTRODUCTION

Overview

Dr. C. Everett Koop, former U.S. Surgeon General, once said, "The best prescription is knowledge."[1] The Agency for Healthcare Research and Quality (AHRQ) of the National Institutes of Health (NIH) echoes this view and recommends that every patient incorporate education into the treatment process. According to the AHRQ:

> Finding out more about your condition is a good place to start. By contacting groups that support your condition, visiting your local library, and searching on the Internet, you can find good information to help guide your treatment decisions. Some information may be hard to find—especially if you don't know where to look.[2]

As the AHRQ mentions, finding the right information is not an obvious task. Though many physicians and public officials had thought that the emergence of the Internet would do much to assist patients in obtaining reliable information, in March 2001 the National Institutes of Health issued the following warning:

> The number of Web sites offering health-related resources grows every day. Many sites provide valuable information, while others may have information that is unreliable or misleading.[3]

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[1] Quotation from **http://www.drkoop.com**.
[2] The Agency for Healthcare Research and Quality (AHRQ): **http://www.ahcpr.gov/consumer/diaginfo.htm**.
[3] From the NIH, National Cancer Institute (NCI): **http://cancertrials.nci.nih.gov/beyond/evaluating.html**.

Since the late 1990s, physicians have seen a general increase in patient Internet usage rates. Patients frequently enter their doctor's offices with printed Web pages of home remedies in the guise of latest medical research. This scenario is so common that doctors often spend more time dispelling misleading information than guiding patients through sound therapies. *The Official Patient's Sourcebook on Vibrio Vulnificus Infection* has been created for patients who have decided to make education and research an integral part of the treatment process. The pages that follow will tell you where and how to look for information covering virtually all topics related to Vibrio vulnificus infection, from the essentials to the most advanced areas of research.

The title of this book includes the word "official." This reflects the fact that the sourcebook draws from public, academic, government, and peer-reviewed research. Selected readings from various agencies are reproduced to give you some of the latest official information available to date on Vibrio vulnificus infection.

Given patients' increasing sophistication in using the Internet, abundant references to reliable Internet-based resources are provided throughout this sourcebook. Where possible, guidance is provided on how to obtain free-of-charge, primary research results as well as more detailed information via the Internet. E-book and electronic versions of this sourcebook are fully interactive with each of the Internet sites mentioned (clicking on a hyperlink automatically opens your browser to the site indicated). Hard copy users of this sourcebook can type cited Web addresses directly into their browsers to obtain access to the corresponding sites. Since we are working with ICON Health Publications, hard copy *Sourcebooks* are frequently updated and printed on demand to ensure that the information provided is current.

In addition to extensive references accessible via the Internet, every chapter presents a "Vocabulary Builder." Many health guides offer glossaries of technical or uncommon terms in an appendix. In editing this sourcebook, we have decided to place a smaller glossary within each chapter that covers terms used in that chapter. Given the technical nature of some chapters, you may need to revisit many sections. Building one's vocabulary of medical terms in such a gradual manner has been shown to improve the learning process.

We must emphasize that no sourcebook on Vibrio vulnificus infection should affirm that a specific diagnostic procedure or treatment discussed in a research study, patent, or doctoral dissertation is "correct" or your best option. This sourcebook is no exception. Each patient is unique. Deciding on

appropriate options is always up to the patient in consultation with their physician and healthcare providers.

Organization

This sourcebook is organized into three parts. Part I explores basic techniques to researching Vibrio vulnificus infection (e.g. finding guidelines on diagnosis, treatments, and prognosis), followed by a number of topics, including information on how to get in touch with organizations, associations, or other patient networks dedicated to Vibrio vulnificus infection. It also gives you sources of information that can help you find a doctor in your local area specializing in treating Vibrio vulnificus infection. Collectively, the material presented in Part I is a complete primer on basic research topics for patients with Vibrio vulnificus infection.

Part II moves on to advanced research dedicated to Vibrio vulnificus infection. Part II is intended for those willing to invest many hours of hard work and study. It is here that we direct you to the latest scientific and applied research on Vibrio vulnificus infection. When possible, contact names, links via the Internet, and summaries are provided. It is in Part II where the vocabulary process becomes important as authors publishing advanced research frequently use highly specialized language. In general, every attempt is made to recommend "free-to-use" options.

Part III provides appendices of useful background reading for all patients with Vibrio vulnificus infection or related disorders. The appendices are dedicated to more pragmatic issues faced by many patients with Vibrio vulnificus infection. Accessing materials via medical libraries may be the only option for some readers, so a guide is provided for finding local medical libraries which are open to the public. Part III, therefore, focuses on advice that goes beyond the biological and scientific issues facing patients with Vibrio vulnificus infection.

Scope

While this sourcebook covers Vibrio vulnificus infection, your doctor, research publications, and specialists may refer to your condition using a variety of terms. Therefore, you should understand that Vibrio vulnificus infection is often considered a synonym or a condition closely related to the following:

- Halophilic Vibrio

In addition to synonyms and related conditions, physicians may refer to Vibrio vulnificus infection using certain coding systems. The International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) is the most commonly used system of classification for the world's illnesses. Your physician may use this coding system as an administrative or tracking tool. The following classification is commonly used for Vibrio vulnificus infection:[4]

- 005.81 food poisoning due to vibrio vulnificus

For the purposes of this sourcebook, we have attempted to be as inclusive as possible, looking for official information for all of the synonyms relevant to Vibrio vulnificus infection. You may find it useful to refer to synonyms when accessing databases or interacting with healthcare professionals and medical librarians.

Moving Forward

Since the 1980s, the world has seen a proliferation of healthcare guides covering most illnesses. Some are written by patients or their family members. These generally take a layperson's approach to understanding and coping with an illness or disorder. They can be uplifting, encouraging, and highly supportive. Other guides are authored by physicians or other healthcare providers who have a more clinical outlook. Each of these two styles of guide has its purpose and can be quite useful.

As editors, we have chosen a third route. We have chosen to expose you to as many sources of official and peer-reviewed information as practical, for the purpose of educating you about basic and advanced knowledge as recognized by medical science today. You can think of this sourcebook as your personal Internet age reference librarian.

Why "Internet age"? All too often, patients diagnosed with Vibrio vulnificus infection will log on to the Internet, type words into a search engine, and receive several Web site listings which are mostly irrelevant or redundant.

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[4] This list is based on the official version of the World Health Organization's 9th Revision, International Classification of Diseases (ICD-9). According to the National Technical Information Service, "ICD-9CM extensions, interpretations, modifications, addenda, or errata other than those approved by the U.S. Public Health Service and the Health Care Financing Administration are not to be considered official and should not be utilized. Continuous maintenance of the ICD-9-CM is the responsibility of the federal government."

These patients are left to wonder where the relevant information is, and how to obtain it. Since only the smallest fraction of information dealing with Vibrio vulnificus infection is even indexed in search engines, a non-systematic approach often leads to frustration and disappointment. With this sourcebook, we hope to direct you to the information you need that you would not likely find using popular Web directories. Beyond Web listings, in many cases we will reproduce brief summaries or abstracts of available reference materials. These abstracts often contain distilled information on topics of discussion.

While we focus on the more scientific aspects of Vibrio vulnificus infection, there is, of course, the emotional side to consider. Later in the sourcebook, we provide a chapter dedicated to helping you find peer groups and associations that can provide additional support beyond research produced by medical science. We hope that the choices we have made give you the most options available in moving forward. In this way, we wish you the best in your efforts to incorporate this educational approach into your treatment plan.

The Editors

PART I: THE ESSENTIALS

ABOUT PART I

Part I has been edited to give you access to what we feel are "the essentials" on Vibrio vulnificus infection. The essentials of a disease typically include the definition or description of the disease, a discussion of who it affects, the signs or symptoms associated with the disease, tests or diagnostic procedures that might be specific to the disease, and treatments for the disease. Your doctor or healthcare provider may have already explained the essentials of Vibrio vulnificus infection to you or even given you a pamphlet or brochure describing Vibrio vulnificus infection. Now you are searching for more in-depth information. As editors, we have decided, nevertheless, to include a discussion on where to find essential information that can complement what your doctor has already told you. In this section we recommend a process, not a particular Web site or reference book. The process ensures that, as you search the Web, you gain background information in such a way as to maximize your understanding.

CHAPTER 1. THE ESSENTIALS ON VIBRIO VULNIFICUS INFECTION: GUIDELINES

Overview

Official agencies, as well as federally-funded institutions supported by national grants, frequently publish a variety of guidelines on Vibrio vulnificus infection. These are typically called "Fact Sheets" or "Guidelines." They can take the form of a brochure, information kit, pamphlet, or flyer. Often they are only a few pages in length. The great advantage of guidelines over other sources is that they are often written with the patient in mind. Since new guidelines on Vibrio vulnificus infection can appear at any moment and be published by a number of sources, the best approach to finding guidelines is to systematically scan the Internet-based services that post them.

The National Institutes of Health (NIH)[5]

The National Institutes of Health (NIH) is the first place to search for relatively current patient guidelines and fact sheets on Vibrio vulnificus infection. Originally founded in 1887, the NIH is one of the world's foremost medical research centers and the federal focal point for medical research in the United States. At any given time, the NIH supports some 35,000 research grants at universities, medical schools, and other research and training institutions, both nationally and internationally. The rosters of those who have conducted research or who have received NIH support over the years include the world's most illustrious scientists and physicians. Among them are 97 scientists who have won the Nobel Prize for achievement in medicine.

[5] Adapted from the NIH: **http://www.nih.gov/about/NIHoverview.html**.

There is no guarantee that any one Institute will have a guideline on a specific disease, though the National Institutes of Health collectively publish over 600 guidelines for both common and rare diseases. The best way to access NIH guidelines is via the Internet. Although the NIH is organized into many different Institutes and Offices, the following is a list of key Web sites where you are most likely to find NIH clinical guidelines and publications dealing with Vibrio vulnificus infection and associated conditions:

- Office of the Director (OD); guidelines consolidated across agencies available at **http://www.nih.gov/health/consumer/conkey.htm**
- National Library of Medicine (NLM); extensive encyclopedia (A.D.A.M., Inc.) with guidelines available at **http://www.nlm.nih.gov/medlineplus/healthtopics.html**
- National Institute of Allergy and Infectious Diseases (NIAID); guidelines available at **http://www.niaid.nih.gov/publications/**
- Centers for Disease Control and Prevention: various fact sheets on infectious diseases at **http://www.cdc.gov/health/diseases.htm**

Among the above, the National Institute of Allergy and Infectious Diseases (NIAID) is particularly noteworthy. The mission of the NIAID is to provide support for scientists conducting research aimed at developing better ways to diagnose, treat, and prevent the many infectious, immunologic and allergic diseases that afflict people worldwide.[6] The NIAID is composed of four extramural divisions: the Division of AIDS; the Division of Allergy, Immunology and Transplantation; the Division of Microbiology and Infectious Diseases; and the Division of Extramural Activities. In addition, NIAID scientists conduct intramural research in laboratories located in Bethesda, Rockville and Frederick, Maryland, and in Hamilton, Montana. The following patient guideline was recently published by the NIAID on Vibrio vulnificus infection.

What Is Vibrio Vulnificus?[7]

Vibrio vulnificus is a bacterium in the same family as those that cause cholera. It normally lives in warm seawater and is part of a group of vibrios that are called "halophilic" because they require salt.

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[6] This paragraph has been adapted from the NIAID: **http://www.niaid.nih.gov/facts/overview.htm**. "Adapted" signifies that a passage has been reproduced exactly or slightly edited for this book.

[7] Adapted from The Centers for Disease Control and Prevention (CDC): **http://www.cdc.gov/ncidod/dbmd/diseaseinfo/vibriovulnificus_g.htm**.

What Type of Illness Does V. Vulnificus Cause?

V. vulnificus can cause disease in those who eat contaminated seafood or have an open wound that is exposed to seawater. Among healthy people, ingestion of V. vulnificus can cause vomiting, diarrhea, and abdominal pain. In immunocompromised persons, particularly those with chronic liver disease, V. vulnificus can infect the bloodstream, causing a severe and life-threatening illness characterized by fever and chills, decreased blood pressure (septic shock), and blistering skin lesions. V. vulnificus bloodstream infections are fatal about 50% of the time.

V. vulnificus can also cause an infection of the skin when open wounds are exposed to warm seawater; these infections may lead to skin breakdown and ulceration. Persons who are immunocompromised are at higher risk for invasion of the organism into the bloodstream and potentially fatal complications.

How Common Is V. Vulnificus Infection?

V. vulnificus is a rare cause of disease, but it is also underreported. Between 1988 and 1995, CDC received reports of over 300 V. vulnificus infections from the Gulf Coast states, where the majority of cases occur. There is no national surveillance system for V. vulnificus, but CDC collaborates with the states of Alabama, Florida, Louisiana, Texas, and Mississippi to monitor the number of cases of V. vulnificus infection in the Gulf Coast region.

How Do Persons Get Infected with V. Vulnificus?

Persons who are immunocompromised, especially those with chronic liver disease, are at risk for V. vulnificus when they eat raw seafood, particularly oysters. A recent study showed that people with these pre-existing medical conditions were 80 times more likely to develop V. vulnificus bloodstream infections than were healthy people. The bacterium is frequently isolated from oysters and other shellfish in warm coastal waters during the summer months. Since it is naturally found in warm marine waters, people with open wounds can be exposed to V. vulnificus through direct contact with seawater. There is no evidence for person-to-person transmission of V. vulnificus.

How Can V. Vulnificus Infection Be Diagnosed?

V. vulnificus infection is diagnosed by routine stool, wound, or blood cultures; the laboratory should be notified when this infection is suspected by the physician, since a special growth medium can be used to increase the diagnostic yield. Doctors should have a high suspicion for this organism when patients present with gastrointestinal illness, fever, or shock following the ingestion of raw seafood, especially oysters, or with a wound infection after exposure to seawater.

How Is V. Vulnificus Infection Treated?

V. vulnificus infection is treated with antibiotics. Doxycycline or a third-generation cephalosporin (e.g., ceftazidime) is appropriate.

Are There Long-Term Consequences of V. Vulnificus Infection?

V. vulnificus infection is an acute illness, and those who recover should not expect any long-term consequences.

What Can Be Done to Improve the Safety of Oysters?

Although oysters can be harvested legally only from waters free from fecal contamination, even legally harvested oysters can be contaminated with V. vulnificus because the bacterium is naturally present in marine environments. V. vulnificus does not alter the appearance, taste, or odor of oysters. Timely, voluntary reporting of V. vulnificus infections to CDC and to regional offices of the Food and Drug Administration (FDA) will help collaborative efforts to improve investigation of these infections. Regional FDA specialists with expert knowledge about shellfish assist state officials with tracebacks of shellfish and, when notified rapidly about cases, are able to sample harvest waters to discover possible sources of infection and to close oyster beds when problems are identified. Ongoing research may help us to predict environmental or other factors that increase the chance that oysters carry pathogens.

How Can I Learn More about V. Vulnificus?

You can discuss your medical concerns with your doctor or other health care provider. Your local city or county health department can provide information about this and other public health problems that are occurring in your area. Information about the potential dangers of raw oyster consumption is available 24 hours a day from the FDA's Seafood Hotline (telephone 1-800-332-4010); FDA public affairs specialists are available at this number between 12 and 4 p.m. Monday through Friday. Information is also available on the World Wide Web at **http://vm.cfsan.fda.gov**.

Some tips for preventing V. vulnificus infections, particularly among immunocompromised patients, including those with underlying liver disease:

- Do not eat raw oysters or other raw shellfish.
- Cook shellfish (oysters, clams, mussels) thoroughly:
- For shellfish in the shell, either a) boil until the shells open and continue boiling for 5 more minutes, or b) steam until the shells open and then continue cooking for 9 more minutes. Do not eat those shellfish that do not open during cooking. Boil shucked oysters at least 3 minutes, or fry them in oil at least 10 minutes at 375°F.
- Avoid cross-contamination of cooked seafood and other foods with raw seafood and juices from raw seafood.
- Eat shellfish promptly after cooking and refrigerate leftovers.
- Avoid exposure of open wounds or broken skin to warm salt or brackish water, or to raw shellfish harvested from such waters.
- Wear protective clothing (e.g., gloves) when handling raw shellfish.

Vibrio Vulnificus Infection: Technical Notes

The Division of Bacterial and Mycotic Diseases of the CDC publishes summary information on Vibrio vulnificus infection for use by healthcare professionals and physicians. The information is presented in the form of notes. The notes are written in a rather technical language. A few medical expressions are particularly noteworthy. "Clinical features" generally cover the signs and symptoms of Vibrio vulnificus infection that can help the doctor with diagnosis. It may also include a discussion of the cause or "etiology" of Vibrio vulnificus infection. "Etiologic agent" signifies the

particular organism, typically written in Latin, which causes or is associated with Vibrio vulnificus infection. "Reservoir" indicates the habitat or living environment of the organism. "Incidence" describes the number of people that are diagnosed with Vibrio vulnificus infection within a given population. "Sequelae" includes any related health consequences or secondary pathological conditions and diseases that may result from Vibrio vulnificus infection. "Transmission" describes how a disease spreads. "Risk Groups" are people who are most likely to be diagnosed with Vibrio vulnificus infection. "Surveillance" describes how Vibrio vulnificus infection is monitored by government officials across the population. "Challenges" and "Opportunities" are issues or areas where officials think progress might be made in understanding or combating Vibrio vulnificus infection in the future. The notes that follow were recently published by the CDC.[8]

Clinical Features

Wound or soft tissue infections. In persons with underlying medical conditions, especially liver disease, can cause bloodstream infections characterized by fever, chills, decreased blood pressure, blistering skin lesions, and often, death. In otherwise heathy persons, causes diarrhea, vomiting, and abdominal pain.

Etiologic Agent

Vibrio vulnificus, a halophilic (salt-requiring) gram-negative bacterium naturally and commonly found in marine and estuarine environments.

Incidence

An average of 40 culture-confirmed cases, 35 hospitalizations, and 12 deaths are reported each year from the Gulf Coast region (reporting states are Alabama, Florida, Louisiana, Mississippi, and Texas). Nationwide, there are as many as 95 cases (half of which are culture confirmed), 85 hospitalizations, and 35 deaths.

[8] Adapted from The Centers for Disease Control and Prevention (CDC): **http://www.cdc.gov/ncidod/dbmd/diseaseinfo/vibriovulnificus_t.htm**.

Sequelae

Bloodstream infections in persons with liver disease are fatal approximately 50% of the time. Persons who recover suffer no long-term consequences.

Transmission

Eating raw or undercooked shellfish, particularly oysters harvested from warmer waters. Wound infections may occur when wounds or soft tissues are exposed to warm seawater.

Risk Groups

All persons. Persons with underlying medical conditions, especially liver disease, may be at increased risk of infection and serious complications.

Surveillance

Twenty states require reporting of Vibrio infections. Surveillance for culture-confirmed infections has been conducted in the Gulf Coast states of Alabama, Florida, Louisiana, Mississippi, and Texas since 1988, and expanded to include FoodNet states in 1996.

Trends

Infections are seasonal; over 85% occur between May and October. Environmental factors, such as warm water and moderate salinity, can increase the number of V. vulnificus organisms in shellfish.

Challenges

Many persons prefer to consume oysters raw. Many persons with liver disease are unaware of the hazards of raw oyster consumption and exposure to warm seawater.

Opportunities

Education focusing on the risks associated with consumption of raw and undercooked shellfish, especially in warm months. Implement refrigeration from harvesting to consumption. Timely reporting of V. vulnificus infections. Revision of the standards used for closing and re-opening of oyster beds to take into account the role of environmental factors.

Additional Technical Information

Surveillance

- Vibrio Surveillance System, Survey Data, 1999: **http://www.cdc.gov/ncidod/dbmd/diseaseinfo/files/VibCSTE99web.pdf**
- Vibrio Surveillance System, Survey Data, 1997-1998: **http://www.cdc.gov/ncidod/dbmd/diseaseinfo/cstevib99.pdf**

MMWR Articles

- Vibrio vulnificus Infections Associated with Eating Raw Oysters - Los Angeles, 1996, MMWR July 26, 1996 / Vol. 45 / No. 29: **http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/00043142.htm**
- Vibrio vulnificus Infections Associated with Raw Oyster Consumption - Florida, 1981-1992, MMWR June 4, 1993 / Vol. 42 / No. 21: **http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/00020736.htm**

More Guideline Sources

The guideline above on Vibrio vulnificus infection is only one example of the kind of material that you can find online and free of charge. The remainder of this chapter will direct you to other sources which either publish or can help you find additional guidelines on topics related to Vibrio vulnificus infection. Many of the guidelines listed below address topics that may be of particular relevance to your specific situation or of special interest to only some patients with Vibrio vulnificus infection. Due to space limitations these sources are listed in a concise manner. Do not hesitate to consult the following sources by either using the Internet hyperlink provided, or, in cases where the contact information is provided, contacting the publisher or author directly.

Topic Pages: MEDLINEplus

For patients wishing to go beyond guidelines published by specific Institutes of the NIH, the National Library of Medicine has created a vast and patient-oriented healthcare information portal called MEDLINEplus. Within this Internet-based system are "health topic pages." You can think of a health topic page as a guide to patient guides. To access this system, log on to **http://www.nlm.nih.gov/medlineplus/healthtopics.html**. From there you can either search using the alphabetical index or browse by broad topic areas.

If you do not find topics of interest when browsing health topic pages, then you can choose to use the advanced search utility of MEDLINEplus at **http://www.nlm.nih.gov/medlineplus/advancedsearch.html**. This utility is similar to the NIH Search Utility, with the exception that it only includes material linked within the MEDLINEplus system (mostly patient-oriented information). It also has the disadvantage of generating unstructured results. We recommend, therefore, that you use this method only if you have a very targeted search.

The Combined Health Information Database (CHID)

CHID Online is a reference tool that maintains a database directory of thousands of journal articles and patient education guidelines on Vibrio vulnificus infection and related conditions. One of the advantages of CHID over other sources is that it offers summaries that describe the guidelines available, including contact information and pricing. CHID's general Web site is **http://chid.nih.gov/**. To search this database, go to **http://chid.nih.gov/detail/detail.html**. In particular, you can use the advanced search options to look up pamphlets, reports, brochures, and information kits. The following was recently posted in this archive:

- **Is Your Food Safe?**

  Source: Santa Cruz, CA: ETR Associates. 1998. 6 p.

  Contact: Available from ETR Associates. P.O. Box 1830, Santa Cruz, CA 95061-1830. (800) 321-4407. Fax (800) 435-8433. Website: www.etr.org. Price: Single copy free; bulk copies available. Order number: R027.

  Summary: This brochure describes foodborne illnesses and their prevention. If food is poorly handled or not cooked or stored properly, bacteria can multiply and cause illness. Not everyone who eats contaminated food will become sick. The symptoms depend on which

organism was eaten, how much was eaten, and what the age and general health of the person are. Symptoms of food poisoning are similar to those of stomach flu and include nausea, vomiting, diarrhea, stomach pain or cramps, and fever, fatigue, and feelings of weakness. The brochure lists nine organisms and how they are usually transmitted; organisms and diseases discussed are botulism, Campylobacter, Crytosporidiosis, cyclospora, E. coli (0157:H7), hepatitis A, listeriosis, Salmonella, and Vibrio vulnificus. The brochure notes that mild illness usually gets better on its own and provides basic strategies for handling symptoms of mild food poisoning. The brochure also lists symptoms that would indicate the need to contact a health care provider and notes people more at risk for problems from food poisoning. The centerpiece of the brochure offers U.S. Department of Agriculture strategies for keeping food safe: the six areas covered are buying, storing, preparing, cooking, and serving food, and eating out. A chart summarizes the time that fresh meat, fish, poultry, cheese, eggs, and milk will last in the refrigerator or in the freezer. One sidebar lists safe kitchen tips (primarily relating to hygiene).

The National Guideline Clearinghouse™

The National Guideline Clearinghouse™ offers hundreds of evidence-based clinical practice guidelines published in the United States and other countries. You can search their site located at **http://www.guideline.gov** by using the keyword "Vibrio vulnificus infection" or synonyms. The following was recently posted:

- **Diagnosis and management of foodborne illnesses: a primer for physicians.**

  Source: Centers for Disease Control and Prevention/American Medical Association/Food Safety and Inspection Service/Center for Food Safety and Applied Nutrition.; Reprint released 2001 January; 88 pages

  http://www.guideline.gov/FRAMESETS/guideline_fs.asp?guideline=001933&sSearch_string=vibrio+vulnificus

- **Practice guidelines for the management of infectious diarrhea.**

  Source: Infectious Diseases Society of America.; 2001 February; 21 pages

  http://www.guideline.gov/FRAMESETS/guideline_fs.asp?guideline=002017&sSearch_string=vibrio+vulnificus

Healthfinder™

Healthfinder™ is an additional source sponsored by the U.S. Department of Health and Human Services which offers links to hundreds of other sites that contain healthcare information. This Web site is located at **http://www.healthfinder.gov**. Again, keyword searches can be used to find guidelines. The following was recently found in this database:

- **Bad Bug Book -- Foodborne Pathogenic Microorganisms and Natural Toxins**

  Summary: The Bad Bug Book is a comprehensive reference site for the full range of foodborne pathogens including pathenogenic bacteria such as salmonella, campylobacter, and vibrio; the enterovirulent

  Source: Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration

  http://www.healthfinder.gov/scripts/recordpass.asp?RecordType=0&RecordID=304

The NIH Search Utility

After browsing the references listed at the beginning of this chapter, you may want to explore the NIH Search Utility. This allows you to search for documents on over 100 selected Web sites that comprise the NIH-WEB-SPACE. Each of these servers is "crawled" and indexed on an ongoing basis. Your search will produce a list of various documents, all of which will relate in some way to Vibrio vulnificus infection. The drawbacks of this approach are that the information is not organized by theme and that the references are often a mix of information for professionals and patients. Nevertheless, a large number of the listed Web sites provide useful background information. We can only recommend this route, therefore, for relatively rare or specific disorders, or when using highly targeted searches. To use the NIH search utility, visit the following Web page: **http://search.nih.gov/index.html**.

Additional Web Sources

A number of Web sites that often link to government sites are available to the public. These can also point you in the direction of essential information. The following is a representative sample:

- AOL: **http://search.aol.com/cat.adp?id=168&layer=&from=subcats**
- drkoop.com®: **http://www.drkoop.com/conditions/ency/index.html**
- Family Village: **http://www.familyvillage.wisc.edu/specific.htm**
- Google: **http://directory.google.com/Top/Health/Conditions_and_Diseases/**
- Med Help International: **http://www.medhelp.org/HealthTopics/A.html**
- Open Directory Project: **http://dmoz.org/Health/Conditions_and_Diseases/**
- Yahoo.com: **http://dir.yahoo.com/Health/Diseases_and_Conditions/**
- WebMD®Health: **http://my.webmd.com/health_topics**

Vocabulary Builder

The material in this chapter may have contained a number of unfamiliar words. The following Vocabulary Builder introduces you to terms used in this chapter that have not been covered in the previous chapter:

Abdominal: Pertaining to the abdomen. [EU]

Antibiotic: A chemical substance produced by a microorganism which has the capacity, in dilute solutions, to inhibit the growth of or to kill other microorganisms. Antibiotics that are sufficiently nontoxic to the host are used as chemotherapeutic agents in the treatment of infectious diseases of man, animals and plants. [EU]

Campylobacter: A genus of bacteria found in the reproductive organs, intestinal tract, and oral cavity of animals and man. Some species are pathogenic. [NIH]

Ceftazidime: Semisynthetic, broad-spectrum antibacterial derived from cephaloridine and used especially for Pseudomonas and other gram-negative infections in debilitated patients. [NIH]

Cholera: An acute diarrheal disease endemic in India and Southeast Asia whose causative agent is vibrio cholerae. This condition can lead to severe dehydration in a matter of hours unless quickly treated. [NIH]

Chronic: Persisting over a long period of time. [EU]

Cyclospora: A genus of coccidian parasites in the family eimeriidae. Cyclospora cayetanensis is pathogenic in humans, probably transmitted via the fecal-oral route, and causes nausea and diarrhea. [NIH]

Diarrhea: Passage of excessively liquid or excessively frequent stools. [NIH]

Doxycycline: A synthetic tetracycline derivative with a range of antimicrobial activity and mode of action similar to that of tetracycline, but more effective against many species. Animal studies suggest that it may cause less tooth staining than other tetracyclines. [NIH]

Fatigue: The state of weariness following a period of exertion, mental or physical, characterized by a decreased capacity for work and reduced efficiency to respond to stimuli. [NIH]

Gastrointestinal: Pertaining to or communicating with the stomach and intestine, as a gastrointestinal fistula. [EU]

Hepatitis: Inflammation of the liver. [EU]

Ingestion: The act of taking food, medicines, etc., into the body, by mouth. [EU]

Lesion: Any pathological or traumatic discontinuity of tissue or loss of function of a part. [EU]

Microbiology: The study of microorganisms such as fungi, bacteria, algae, archaea, and viruses. [NIH]

Microorganism: A microscopic organism; those of medical interest include bacteria, viruses, fungi and protozoa. [EU]

Mycotic: Pertaining to a mycosis; caused by fungi. [EU]

Nausea: An unpleasant sensation, vaguely referred to the epigastrium and abdomen, and often culminating in vomiting. [EU]

Pathogen: Any disease-producing microorganism. [EU]

Poisoning: A condition or physical state produced by the ingestion, injection or inhalation of, or exposure to a deleterious agent. [NIH]

Salmonella: A genus of gram-negative, facultatively anaerobic, rod-shaped bacteria that utilizes citrate as a sole carbon source. It is pathogenic for humans, causing enteric fevers, gastroenteritis, and bacteremia. Food poisoning is the most common clinical manifestation. Organisms within this genus are separated on the basis of antigenic characteristics, sugar fermentation patterns, and bacteriophage susceptibility. [NIH]

Septic: Produced by or due to decomposition by microorganisms; putrefactive. [EU]

Stomach: An organ of digestion situated in the left upper quadrant of the abdomen between the termination of the esophagus and the beginning of the

duodenum. [NIH]

Transplantation: The grafting of tissues taken from the patient's own body or from another. [EU]

Vibrio: A genus of vibrionaceae, made up of short, slightly curved, motile, gram-negative rods. Various species produce cholera and other gastrointestinal disorders as well as abortion in sheep and cattle. [NIH]

CHAPTER 2. SEEKING GUIDANCE

Overview

Some patients are comforted by the knowledge that a number of organizations dedicate their resources to helping people with Vibrio vulnificus infection. These associations can become invaluable sources of information and advice. Many associations offer aftercare support, financial assistance, and other important services. Furthermore, healthcare research has shown that support groups often help people to better cope with their conditions.[9] In addition to support groups, your physician can be a valuable source of guidance and support. Therefore, finding a physician that can work with your unique situation is a very important aspect of your care.

In this chapter, we direct you to resources that can help you find patient organizations and medical specialists. We begin by describing how to find associations and peer groups that can help you better understand and cope with Vibrio vulnificus infection. The chapter ends with a discussion on how to find a doctor that is right for you.

Associations and Vibrio Vulnificus Infection

As mentioned by the Agency for Healthcare Research and Quality, sometimes the emotional side of an illness can be as taxing as the physical side.[10] You may have fears or feel overwhelmed by your situation. Everyone has different ways of dealing with disease or physical injury. Your attitude, your expectations, and how well you cope with your condition can all

[9] Churches, synagogues, and other houses of worship might also have groups that can offer you the social support you need.
[10] This section has been adapted from **http://www.ahcpr.gov/consumer/diaginf5.htm**.

influence your well-being. This is true for both minor conditions and serious illnesses. For example, a study on female breast cancer survivors revealed that women who participated in support groups lived longer and experienced better quality of life when compared with women who did not participate. In the support group, women learned coping skills and had the opportunity to share their feelings with other women in the same situation.
There are a number of directories that list additional medical associations that you may find useful. While not all of these directories will provide different information, by consulting all of them, you will have nearly exhausted all sources for patient associations.

The National Health Information Center (NHIC)

The National Health Information Center (NHIC) offers a free referral service to help people find organizations that provide information about Vibrio vulnificus infection. For more information, see the NHIC's Web site at **http://www.health.gov/NHIC/** or contact an information specialist by calling 1-800-336-4797.

DIRLINE

A comprehensive source of information on associations is the DIRLINE database maintained by the National Library of Medicine. The database comprises some 10,000 records of organizations, research centers, and government institutes and associations which primarily focus on health and biomedicine. DIRLINE is available via the Internet at the following Web site: **http://dirline.nlm.nih.gov/**. Simply type in "Vibrio vulnificus infection" (or a synonym) or the name of a topic, and the site will list information contained in the database on all relevant organizations.

The Combined Health Information Database

Another comprehensive source of information on healthcare associations is the Combined Health Information Database. Using the "Detailed Search" option, you will need to limit your search to "Organizations" and "Vibrio vulnificus infection". Type the following hyperlink into your Web browser: **http://chid.nih.gov/detail/detail.html**. To find associations, use the drop boxes at the bottom of the search page where "You may refine your search by." For publication date, select "All Years." Then, select your preferred language and the format option "Organization Resource Sheet." By making

these selections and typing in "Vibrio vulnificus infection" (or synonyms) into the "For these words:" box, you will only receive results on organizations dealing with Vibrio vulnificus infection. You should check back periodically with this database since it is updated every 3 months.

The National Organization for Rare Disorders, Inc.

The National Organization for Rare Disorders, Inc. has prepared a Web site that provides, at no charge, lists of associations organized by specific diseases. You can access this database at the following Web site: **http://www.rarediseases.org/cgi-bin/nord/searchpage**. Select the option called "Organizational Database (ODB)" and type "Vibrio vulnificus infection" (or a synonym) in the search box.

Online Support Groups

In addition to support groups, commercial Internet service providers offer forums and chat rooms for people with different illnesses and conditions. WebMD®, for example, offers such a service at their Web site: **http://boards.webmd.com/roundtable**. These online self-help communities can help you connect with a network of people whose concerns are similar to yours. Online support groups are places where people can talk informally. If you read about a novel approach, consult with your doctor or other healthcare providers, as the treatments or discoveries you hear about may not be scientifically proven to be safe and effective.

Finding Doctors

One of the most important aspects of your treatment will be the relationship between you and your doctor or specialist. All patients with Vibrio vulnificus infection must go through the process of selecting a physician. While this process will vary from person to person, the Agency for Healthcare Research and Quality makes a number of suggestions, including the following:[11]

- If you are in a managed care plan, check the plan's list of doctors first.
- Ask doctors or other health professionals who work with doctors, such as hospital nurses, for referrals.

[11] This section is adapted from the AHRQ: **www.ahrq.gov/consumer/qntascii/qntdr.htm**.

- Call a hospital's doctor referral service, but keep in mind that these services usually refer you to doctors on staff at that particular hospital. The services do not have information on the quality of care that these doctors provide.
- Some local medical societies offer lists of member doctors. Again, these lists do not have information on the quality of care that these doctors provide.

Additional steps you can take to locate doctors include the following:

- Check with the associations listed earlier in this chapter.
- Information on doctors in some states is available on the Internet at **http://www.docboard.org**. This Web site is run by "Administrators in Medicine," a group of state medical board directors.
- The American Board of Medical Specialties can tell you if your doctor is board certified. "Certified" means that the doctor has completed a training program in a specialty and has passed an exam, or "board," to assess his or her knowledge, skills, and experience to provide quality patient care in that specialty. Primary care doctors may also be certified as specialists. The AMBS Web site is located at **http://www.abms.org/newsearch.asp**.[12] You can also contact the ABMS by phone at 1-866-ASK-ABMS.
- You can call the American Medical Association (AMA) at 800-665-2882 for information on training, specialties, and board certification for many licensed doctors in the United States. This information also can be found in "Physician Select" at the AMA's Web site: **http://www.ama-assn.org/aps/amahg.htm**.

If the previous sources did not meet your needs, you may want to log on to the Web site of the National Organization for Rare Disorders (NORD) at **http://www.rarediseases.org/**. NORD maintains a database of doctors with expertise in various rare diseases. The Metabolic Information Network (MIN), 800-945-2188, also maintains a database of physicians with expertise in various metabolic diseases.

[12] While board certification is a good measure of a doctor's knowledge, it is possible to receive quality care from doctors who are not board certified.

Selecting Your Doctor[13]

When you have compiled a list of prospective doctors, call each of their offices. First, ask if the doctor accepts your health insurance plan and if he or she is taking new patients. If the doctor is not covered by your plan, ask yourself if you are prepared to pay the extra costs. The next step is to schedule a visit with your chosen physician. During the first visit you will have the opportunity to evaluate your doctor and to find out if you feel comfortable with him or her. Ask yourself, did the doctor:

- Give me a chance to ask questions about Vibrio vulnificus infection?
- Really listen to my questions?
- Answer in terms I understood?
- Show respect for me?
- Ask me questions?
- Make me feel comfortable?
- Address the health problem(s) I came with?
- Ask me my preferences about different kinds of treatments for Vibrio vulnificus infection?
- Spend enough time with me?

Trust your instincts when deciding if the doctor is right for you. But remember, it might take time for the relationship to develop. It takes more than one visit for you and your doctor to get to know each other.

Working with Your Doctor[14]

Research has shown that patients who have good relationships with their doctors tend to be more satisfied with their care and have better results. Here are some tips to help you and your doctor become partners:

- You know important things about your symptoms and your health history. Tell your doctor what you think he or she needs to know.
- It is important to tell your doctor personal information, even if it makes you feel embarrassed or uncomfortable.

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[13] This section has been adapted from the AHRQ: **www.ahrq.gov/consumer/qntascii/qntdr.htm**.

[14] This section has been adapted from the AHRQ: **www.ahrq.gov/consumer/qntascii/qntdr.htm**.

- Bring a "health history" list with you (and keep it up to date).
- Always bring any medications you are currently taking with you to the appointment, or you can bring a list of your medications including dosage and frequency information. Talk about any allergies or reactions you have had to your medications.
- Tell your doctor about any natural or alternative medicines you are taking.
- Bring other medical information, such as x-ray films, test results, and medical records.
- Ask questions. If you don't, your doctor will assume that you understood everything that was said.
- Write down your questions before your visit. List the most important ones first to make sure that they are addressed.
- Consider bringing a friend with you to the appointment to help you ask questions. This person can also help you understand and/or remember the answers.
- Ask your doctor to draw pictures if you think that this would help you understand.
- Take notes. Some doctors do not mind if you bring a tape recorder to help you remember things, but always ask first.
- Let your doctor know if you need more time. If there is not time that day, perhaps you can speak to a nurse or physician assistant on staff or schedule a telephone appointment.
- Take information home. Ask for written instructions. Your doctor may also have brochures and audio and videotapes that can help you.
- After leaving the doctor's office, take responsibility for your care. If you have questions, call. If your symptoms get worse or if you have problems with your medication, call. If you had tests and do not hear from your doctor, call for your test results. If your doctor recommended that you have certain tests, schedule an appointment to get them done. If your doctor said you should see an additional specialist, make an appointment.

By following these steps, you will enhance the relationship you will have with your physician.

Broader Health-Related Resources

In addition to the references above, the NIH has set up guidance Web sites that can help patients find healthcare professionals. These include:[15]

- Caregivers:
  http://www.nlm.nih.gov/medlineplus/caregivers.html
- Choosing a Doctor or Healthcare Service:
  http://www.nlm.nih.gov/medlineplus/choosingadoctororhealthcareservice.html
- Hospitals and Health Facilities:
  http://www.nlm.nih.gov/medlineplus/healthfacilities.html

[15] You can access this information at:
http://www.nlm.nih.gov/medlineplus/healthsystem.html.

PART II: ADDITIONAL RESOURCES AND ADVANCED MATERIAL

ABOUT PART II

In Part II, we introduce you to additional resources and advanced research on Vibrio vulnificus infection. All too often, patients who conduct their own research are overwhelmed by the difficulty in finding and organizing information. The purpose of the following chapters is to provide you an organized and structured format to help you find additional information resources on Vibrio vulnificus infection. In Part II, as in Part I, our objective is not to interpret the latest advances on Vibrio vulnificus infection or render an opinion. Rather, our goal is to give you access to original research and to increase your awareness of sources you may not have already considered. In this way, you will come across the advanced materials often referred to in pamphlets, books, or other general works. Once again, some of this material is technical in nature, so consultation with a professional familiar with Vibrio vulnificus infection is suggested.

CHAPTER 3. STUDIES ON VIBRIO VULNIFICUS INFECTION

Overview

Every year, academic studies are published on Vibrio vulnificus infection or related conditions. Broadly speaking, there are two types of studies. The first are peer reviewed. Generally, the content of these studies has been reviewed by scientists or physicians. Peer-reviewed studies are typically published in scientific journals and are usually available at medical libraries. The second type of studies is non-peer reviewed. These works include summary articles that do not use or report scientific results. These often appear in the popular press, newsletters, or similar periodicals.

In this chapter, we will show you how to locate peer-reviewed references and studies on Vibrio vulnificus infection. We will begin by discussing research that has been summarized and is free to view by the public via the Internet. We then show you how to generate a bibliography on Vibrio vulnificus infection and teach you how to keep current on new studies as they are published or undertaken by the scientific community.

The Combined Health Information Database

The Combined Health Information Database summarizes studies across numerous federal agencies. To limit your investigation to research studies and Vibrio vulnificus infection, you will need to use the advanced search options. First, go to **http://chid.nih.gov/index.html**. From there, select the "Detailed Search" option (or go directly to that page with the following hyperlink: **http://chid.nih.gov/detail/detail.html**). The trick in extracting studies is found in the drop boxes at the bottom of the search page where "You may refine your search by." Select the dates and language you prefer,

and the format option "Journal Article." At the top of the search form, select the number of records you would like to see (we recommend 100) and check the box to display "whole records." We recommend that you type in "Vibrio vulnificus infection" (or synonyms) into the "For these words:" box. Consider using the option "anywhere in record" to make your search as broad as possible. If you want to limit the search to only a particular field, such as the title of the journal, then select this option in the "Search in these fields" drop box. The following is a sample of what you can expect from this type of search:

- **Microbes on the Menu: Recognizing Foodborne Illness**

  Source: Patient Care for the Nurse Practitioner. 3(6): 33-34, 37-40, 43-45, 49-50, 53-54, 56-57. June 2000.

  Contact: Available from Medical Economics Company. Subscriber Services Department, Patient Care for the Nurse Practitioner, P.O. Box 3000, Denville, NJ 07834-9662. (800) 432-4570.

  Summary: The possibilities for food contamination seem endless and the symptoms of foodborne illness are often vague. This article helps nurse practitioners reliably identify foodborne disease. The primary pathogens implicated in foodborne illness in the United States today are Campylobacter jejuni, Escherichia coli, Listeria monocytogenes, Norwalk and Norwalk like viruses, Salmonella species, Toxoplasma gondii, and Vibrio vulnificus. Toxins such as heavy metals also can contaminate food and cause illness. The clinical picture associated with infection can range from a brief, mild illness for which medical attention is not sought to a severe, life threatening emergency. The very young, the very old, and the immunocompromised are at special risk if they become infected. A food history should be taken whenever foodborne illness is suspected. This should extend back several days because of varying latency periods for the different infections. Stool cultures are imperative for patients at risk, those who become severely ill, and during large outbreaks. Treatment is supportive, with fluids and acetaminophen if fever is present. Antibiotics are useful in some, but not all, foodborne illnesses and are most commonly used in the severely ill or immunocompromised patient. Washing of meat and produce, cooking implements, and the hands is of utmost importance in preventing foodborne illness. Thorough cooking of meat, especially hamburger and chicken, can prevent many types of potentially severe infection. The article includes a sidebar listing related resources on the web. 3 tables. 21 references.

- **Rising Tide of Foodborne and Waterborne Infections**

  Source: Patient Care. 31(9): 31-32, 37-40, 43-44, 53-54, 56, 59. May 15, 1997.

Summary: This article considers the recent media attention given to foodborne and waterborne diseases, focusing on information for health care providers to share with their patients. The authors first review recent foodborne illness outbreaks, then provide readers with guidelines to determine if a patient's nonspecific diarrhea is related to food or water contamination. The recommended approach to the patient with gastroenteritis depends on the answer to these two questions: Have the symptoms been present for longer than a day? Is the diarrhea bloody, or accompanied by fever, dehydration, marked abdominal pain, nausea, or vomiting? Other topics include taking the patient's history, including that for recent specific food intake and travel; treatment options, including rehydration, antimicrobial treatment, and medications for symptomatic relief; reporting foodborne illnesses to public health authorities; the epidemiology of E. coli 0157:H7; how contamination occurs; symptoms of E. coli infection; Salmonella and egg contamination; antibiotics and the food chain; and waterborne hazards, including Vibrio vulnificus, Cryptosporidium, and Cyclospora. 2 figures. 1 table. 15 references. (AA-M).

- **Small Intestinal Infections**

  Source: Current Opinion in Gastroenterology. 7(1): 75-79. February 1991.

  Summary: This article highlights and summarizes recent research in infections of the small intestine. Topics include strongyloidosis; small intestinal bacterial overgrowth; Vibrio infections, including vibrio vulnificus, vibrio cholerae, and vibrio parahaemolyticus; giardiasis; cryptosporidiosis; microsporidiosis in AIDS; and Whipple's disease and Escherichia coli enterotoxin. The author also reviews the usefulness of electron microscopy in diagnosing microsporidial infection and in distinguishing Whipple's disease from other causes of granulomatous disorders. 1 table. 29 annotated references. (AA-M).

Federally-Funded Research on Vibrio Vulnificus Infection

The U.S. Government supports a variety of research studies relating to Vibrio vulnificus infection and associated conditions. These studies are tracked by the Office of Extramural Research at the National Institutes of Health.[16] CRISP (Computerized Retrieval of Information on Scientific

[16] Healthcare projects are funded by the National Institutes of Health (NIH), Substance Abuse and Mental Health Services (SAMHSA), Health Resources and Services Administration (HRSA), Food and Drug Administration (FDA), Centers for Disease Control

Projects) is a searchable database of federally-funded biomedical research projects conducted at universities, hospitals, and other institutions. Visit the site at **http://commons.cit.nih.gov/crisp3/CRISP.Generate_Ticket**. You can perform targeted searches by various criteria including geography, date, as well as topics related to Vibrio vulnificus infection and related conditions.

For most of the studies, the agencies reporting into CRISP provide summaries or abstracts. As opposed to clinical trial research using patients, many federally-funded studies use animals or simulated models to explore Vibrio vulnificus infection and related conditions. In some cases, therefore, it may be difficult to understand how some basic or fundamental research could eventually translate into medical practice. The following sample is typical of the type of information found when searching the CRISP database for Vibrio vulnificus infection:

- **Project Title: Iron Acquisition and Virulence of Vibrio Vulnificus**

  Principal Investigator & Institution: Litwin, Christine M.; Assistant Professor; Pathology; University of Utah 200 S University St Salt Lake City, Ut 84112

  Timing: Fiscal Year 2000; Project Start 1-DEC-1997; Project End 0-NOV-2002

  Summary: (Adapted from the applicant's abstract): The broad long-term objectives of this proposal are to study the role of iron in bacterial pathogenesis, specifically focusing on the pathogen, Vibrio vulnificus. Iron plays a very important role in the pathogenesis of V. vulnificus infections. Patients with iron overload syndromes, such as alcoholic liver disease, cirrhosis and hemochromatosis are particularly susceptible to infections with V. vulnificus . Epidemiological studies suggest that V. vulnificus accounts for over 50% of all vibrio-associated illness in this country. V. vulnificus septicemia has a 50% mortality rate and causes about 15 deaths per year, one of the major causes of death due to foodborne illness. Studying the role of iron in V. vulnificus infections should help define the importance of iron in bacterial virulence. The specific aims of the project are: 1.) To clone and characterize the genes encoding the two major iron-regulated outer membrane proteins of V. vulnificus, the vulnibactin receptor, and the heme receptor. 2.) To examine the roles of heme utilization and catechol siderophore synthesis and uptake in V. vulnificus pathogenesis; and 3.) To examine the effect of iron overload on the ability of macrophages to phagocytize and kill V. vulnificus. The experimental design includes cloning the vulnibactin and

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and Prevention (CDCP), Agency for Healthcare Research and Quality (AHRQ), and Office of Assistant Secretary of Health (OASH).

heme receptor for V. vulnificus. These genes will be analyzed for regulation by iron and the ferric uptake regulatory protein (Fur). V. vulnificus mutants will be constructed in which these genes are inactivated . The mutants will be examined for loss of virulence and the ability to acquire host iron sources. The effect of iron overload on phagocytosis and intracellular killing of V. vulnificus and its mutants will be assessed in iron-loaded and normal macrophages. The methods to be used include using mixtures of oligonucleotide probes derived from the N-terminal protein sequence of the outer membrane proteins (vulnibactin receptor and heme receptor) to screen a genomic DNA library in order to clone these genes. Mutants lacking the vulnibactin receptor and the heme receptor will be constructed by in vivo marker exchange. Utilization of host iron sources will be assessed by a plate assay and kinetic studies. LacZ fusions and Northern blots will be used to analyze the transcriptional regulation of these genes by iron and Fur. The virulence of the V. vulnificus iron acquisition and outer membrane mutants will be analyzed using an infant mouse model of infection and adult iron-loaded and normal mouse models. Phagocytosis and killing will be assessed using an acridine orange technique.

Website: http://commons.cit.nih.gov/crisp3/CRISP.Generate_Ticket

E-Journals: PubMed Central[17]

PubMed Central (PMC) is a digital archive of life sciences journal literature developed and managed by the National Center for Biotechnology Information (NCBI) at the U.S. National Library of Medicine (NLM).[18] Access to this growing archive of e-journals is free and unrestricted.[19] To search, go to **http://www.pubmedcentral.nih.gov/index.html#search**, and type "Vibrio vulnificus infection" (or synonyms) into the search box. This search gives you access to full-text articles. The following is a sample of items found for Vibrio vulnificus infection in the PubMed Central database:

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[17] Adapted from the National Library of Medicine: **http://www.pubmedcentral.nih.gov/about/intro.html**.

[18] With PubMed Central, NCBI is taking the lead in preservation and maintenance of open access to electronic literature, just as NLM has done for decades with printed biomedical literature. PubMed Central aims to become a world-class library of the digital age.

[19] The value of PubMed Central, in addition to its role as an archive, lies the availability of data from diverse sources stored in a common format in a single repository. Many journals already have online publishing operations, and there is a growing tendency to publish material online only, to the exclusion of print.

The National Library of Medicine: PubMed

One of the quickest and most comprehensive ways to find academic studies in both English and other languages is to use PubMed, maintained by the National Library of Medicine. The advantage of PubMed over previously mentioned sources is that it covers a greater number of domestic and foreign references. It is also free to the public.[20] If the publisher has a Web site that offers full text of its journals, PubMed will provide links to that site, as well as to sites offering other related data. User registration, a subscription fee, or some other type of fee may be required to access the full text of articles in some journals.

To generate your own bibliography of studies dealing with Vibrio vulnificus infection, simply go to the PubMed Web site at **www.ncbi.nlm.nih.gov/pubmed**. Type "Vibrio vulnificus infection" (or synonyms) into the search box, and click "Go." The following is the type of output you can expect from PubMed for "Vibrio vulnificus infection" (hyperlinks lead to article summaries):

- **Collagenolytic activity of Vibrio vulnificus: potential contribution to its invasiveness.**
  Author(s): Smith GC, Merkel JR.
  Source: Infection and Immunity. 1982 March; 35(3): 1155-6.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=6279515&dopt=Abstract

- **Regulation of proteolytic activity of Vibrio vulnificus by iron-containing compounds.**
  Author(s): Simpson LM, Oliver JD.
  Source: Microbial Pathogenesis. 1993 March; 14(3): 249-52.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8321126&dopt=Abstract

Vocabulary Builder

Acetaminophen: Analgesic antipyretic derivative of acetanilide. It has weak

[20] PubMed was developed by the National Center for Biotechnology Information (NCBI) at the National Library of Medicine (NLM) at the National Institutes of Health (NIH). The PubMed database was developed in conjunction with publishers of biomedical literature as a search tool for accessing literature citations and linking to full-text journal articles at Web sites of participating publishers. Publishers that participate in PubMed supply NLM with their citations electronically prior to or at the time of publication.

anti-inflammatory properties and is used as a common analgesic, but may cause liver, blood cell, and kidney damage. [NIH]

Agar: A complex sulfated polymer of galactose units, extracted from Gelidium cartilagineum, Gracilaria confervoides, and related red algae. It is used as a gel in the preparation of solid culture media for microorganisms, as a bulk laxative, in making emulsions, and as a supporting medium for immunodiffusion and immunoelectrophoresis. [NIH]

Antimicrobial: Killing microorganisms, or suppressing their multiplication or growth. [EU]

Assay: Determination of the amount of a particular constituent of a mixture, or of the biological or pharmacological potency of a drug. [EU]

Cirrhosis: Liver disease characterized pathologically by loss of the normal microscopic lobular architecture, with fibrosis and nodular regeneration. The term is sometimes used to refer to chronic interstitial inflammation of any organ. [EU]

Cryptosporidiosis: Parasitic intestinal infection with severe diarrhea caused by a protozoan, cryptosporidium. It occurs in both animals and humans. [NIH]

Cryptosporidium: A genus of coccidian parasites of the family cryptosporidiidae, found in the intestinal epithelium of many vertebrates including humans. [NIH]

Dehydration: The condition that results from excessive loss of body water. Called also anhydration, deaquation and hypohydration. [EU]

Escherichia: A genus of gram-negative, facultatively anaerobic, rod-shaped bacteria whose organisms occur in the lower part of the intestine of warm-blooded animals. The species are either nonpathogenic or opportunistic pathogens. [NIH]

Gastroenteritis: An acute inflammation of the lining of the stomach and intestines, characterized by anorexia, nausea, diarrhoea, abdominal pain, and weakness, which has various causes, including food poisoning due to infection with such organisms as Escherichia coli, Staphylococcus aureus, and Salmonella species; consumption of irritating food or drink; or psychological factors such as anger, stress, and fear. Called also enterogastritis. [EU]

Giardiasis: An infection of the small intestine caused by the flagellated protozoan giardia lamblia. It is spread via contaminated food and water and by direct person-to-person contact. [NIH]

Immunity: The condition of being immune; the protection against infectious disease conferred either by the immune response generated by immunization or previous infection or by other nonimmunologic factors (innate i.). [EU]

Kinetic: Pertaining to or producing motion. [EU]

Listeria: A genus of bacteria which may be found in the feces of animals and man, on vegetation, and in silage. Its species are parasitic on cold-blooded and warm-blooded animals, including man. [NIH]

Membrane: A thin layer of tissue which covers a surface, lines a cavity or divides a space or organ. [EU]

Microbiological: Pertaining to microbiology : the science that deals with microorganisms, including algae, bacteria, fungi, protozoa and viruses. [EU]

Microscopy: The application of microscope magnification to the study of materials that cannot be properly seen by the unaided eye. [NIH]

Microsporidiosis: Infections with protozoa of the phylum microspora. [NIH]

Phagocytosis: Endocytosis of particulate material, such as microorganisms or cell fragments. The material is taken into the cell in membrane-bound vesicles (phagosomes) that originate as pinched off invaginations of the plasma membrane. Phagosomes fuse with lysosomes, forming phagolysosomes in which the engulfed material is killed and digested. [EU]

Proteins: Polymers of amino acids linked by peptide bonds. The specific sequence of amino acids determines the shape and function of the protein. [NIH]

Proteolytic: 1. pertaining to, characterized by, or promoting proteolysis. 2. an enzyme that promotes proteolysis (= the splitting of proteins by hydrolysis of the peptide bonds with formation of smaller polypeptides). [EU]

Receptor: 1. a molecular structure within a cell or on the surface characterized by (1) selective binding of a specific substance and (2) a specific physiologic effect that accompanies the binding, e.g., cell-surface receptors for peptide hormones, neurotransmitters, antigens, complement fragments, and immunoglobulins and cytoplasmic receptors for steroid hormones. 2. a sensory nerve terminal that responds to stimuli of various kinds. [EU]

Rehydration: The restoration of water or of fluid content to a body or to substance which has become dehydrated. [EU]

Septicemia: Systemic disease associated with the presence and persistence of pathogenic microorganisms or their toxins in the blood. Called also blood poisoning. [EU]

Species: A taxonomic category subordinate to a genus (or subgenus) and superior to a subspecies or variety, composed of individuals possessing common characters distinguishing them from other categories of individuals of the same taxonomic level. In taxonomic nomenclature, species are designated by the genus name followed by a Latin or Latinized adjective or noun. [EU]

Symptomatic: 1. pertaining to or of the nature of a symptom. 2. indicative (of a particular disease or disorder). 3. exhibiting the symptoms of a particular disease but having a different cause. 4. directed at the allying of symptoms, as symptomatic treatment. [EU]

Toxoplasma: A genus of protozoa parasitic to birds and mammals. T. gondii is one of the most common infectious pathogenic animal parasites of man. [NIH]

Virulence: The degree of pathogenicity within a group or species of microorganisms or viruses as indicated by case fatality rates and/or the ability of the organism to invade the tissues of the host. [NIH]

Viruses: Minute infectious agents whose genomes are composed of DNA or RNA, but not both. They are characterized by a lack of independent metabolism and the inability to replicate outside living host cells. [NIH]

CHAPTER 4. PATENTS ON VIBRIO VULNIFICUS INFECTION

Overview

You can learn about innovations relating to Vibrio vulnificus infection by reading recent patents and patent applications. Patents can be physical innovations (e.g. chemicals, pharmaceuticals, medical equipment) or processes (e.g. treatments or diagnostic procedures). The United States Patent and Trademark Office defines a patent as a grant of a property right to the inventor, issued by the Patent and Trademark Office.[21] Patents, therefore, are intellectual property. For the United States, the term of a new patent is 20 years from the date when the patent application was filed. If the inventor wishes to receive economic benefits, it is likely that the invention will become commercially available to patients with Vibrio vulnificus infection within 20 years of the initial filing. It is important to understand, therefore, that an inventor's patent does not indicate that a product or service is or will be commercially available to patients with Vibrio vulnificus infection. The patent implies only that the inventor has "the right to exclude others from making, using, offering for sale, or selling" the invention in the United States. While this relates to U.S. patents, similar rules govern foreign patents.

In this chapter, we show you how to locate information on patents and their inventors. If you find a patent that is particularly interesting to you, contact the inventor or the assignee for further information.

[21]Adapted from The U. S. Patent and Trademark Office:
http://www.uspto.gov/web/offices/pac/doc/general/whatis.htm.

Patents on Vibrio Vulnificus Infection

By performing a patent search focusing on Vibrio vulnificus infection, you can obtain information such as the title of the invention, the names of the inventor(s), the assignee(s) or the company that owns or controls the patent, a short abstract that summarizes the patent, and a few excerpts from the description of the patent. The abstract of a patent tends to be more technical in nature, while the description is often written for the public. Full patent descriptions contain much more information than is presented here (e.g. claims, references, figures, diagrams, etc.). We will tell you how to obtain this information later in the chapter. The following is an example of the type of information that you can expect to obtain from a patent search on Vibrio vulnificus infection:

- **Species-specific DNA probes for vibrio vulnificus methods and kits**

  Inventor(s): Reeves; Robert H. (Tallahassee, FL), Bennison; Brenda W. (Tallahassee, FL), LaRock; Paul A. (Baton Rouge, LA)

  Assignee(s): Florida State University (Tallahassee, FL)

  Patent Number: 5,426,025

  Date filed: May 28, 1992

  Abstract: The present invention relates to species-specific DNA probes specific for Vibrio vulnificus and Vibrio cholerae. The DNA probes of the present invention specifically detects Vibrio vulnificus or Vibrio cholerae in a mixed bacterial sample based on unique ribosomal RNA nucleotide sequences. When the DNA probes of the present invention are tagged with a labeled molecule such as a fluorescent label, it affords direct and immediate visualization of individual bacterial cells, and a rapid method of detection of bacterial infection in humans and shellfish without culturing.

  Excerpt(s): The present invention relates to species-specific oligonucleotide probes for binding specifically to ribosomal RNA of bacterium Vibrio Vulnificus or Vibrio cholerae. The present invention further relates to methods and kits for identifying the bacteria Vibrio vulnificus or Vibrio cholerae with such probes in a single day, without the need for culturing the bacteria. ... Vibrio vulnificus and Vibrio cholerae are small organisms called bacteria that live in the marine environment. Vibrio cholerae can also survive in fresh water. By drinking water, eating fruits and vegetables, fish or shellfish that are contaminated with this bacterium (one bacteria), a person can become very ill or may even die from the disease cholera which causes severe diarrhea and dehydration. Vibrio vulnificus can cause serious illness and even death

within three days in people who eat raw or improperly cooked fish or shellfish that are infected with this microorganism. ... There are many types of bacteria, both good and bad, in food and water. To find out whether water or food contains these harmful Vibrio bacteria, or if a person is infected with them, laboratory tests must be performed. The first step is to culture, or grow, the bacteria in a special liquid. Then a series of tests are done to identify the bacteria based on whether or not they use certain sugars and other compounds in order to grow. It may take as long as one week to do these tests and by that time a person may die if not given the proper medicine. What is needed is a rapid and easy way to detect and identify Vibrio cholerae and Vibrio vulnificus.

Web site: http://www.delphion.com/details?pn=US05426025__

- **Nucleic acid probes specific for pathogenic strains of vibrio vulnificus and method employing the same**

  Inventor(s): Morris, Jr.; J. Glenn (Baltimore, MD), Wright; Anita (Baltimore, MD)

  Assignee(s): University of Maryland, School of Medicine (Baltimore, MD)

  Patent Number: 5,258,284

  Date filed: January 22, 1991

  Abstract: Nucleic acid probes specific for pathogenic stains of vibrio vulnificus and methods employing the same, comprising nucleic acid hybridization probes specific for the vvh gene of pathogenic strains of vibrio vulnificus.

  Excerpt(s): The present invention relates to nucleic acid hybridization probes specific for pathogenic species of Vibrio vulnificus and methods for employing the same. ... Vibrio vulnificus (V. vulnificus) is an estuarine bacterium that has been associated with severe wound infections or septicemia, particularly in immunocompromised individuals and in persons with conditions such as cirrhosis or hemochromatosis (Blake et al, New Engl. J. Med., 300:1-5 (1979); and Klontz et al, Ann. Intern. Med., 109:318-323 (1980)). Over 50% of persons with septicemia die, and one-third present with shock (Klontz et al, Ann. Intern. Med., 109:318-323 (1980)). The mortality rate among patients who are hypotensive within 24 hours of hospital admission exceeds 90% ((Klontz et al, Ann. Intern. Med., 109:318-323 (1980)). Three-quarters of the patients with septicemia have characteristic bullous skin lesions ((Blake et al, New Engl. J. Med. , 300:1-5 (1979) ; and Klontz et al, Ann. Intern. Med., 109:318-323 (1980)) with histological findings compatible with a toxin-medicated process (Pollack et al, Arch. Intern. Med., 143:837-

838 (1983)). ... Accordingly, it is an object of the present invention to provide commercially and practicably suitable nucleic acid probes that are specific and sensitive for pathogenic strains of Vibrio vulnificus.

Web site: http://www.delphion.com/details?pn=US05258284__

Patent Applications on Vibrio Vulnificus Infection

As of December 2000, U.S. patent applications are open to public viewing.[22] Applications are patent requests which have yet to be granted (the process to achieve a patent can take several years).

Keeping Current

In order to stay informed about patents and patent applications dealing with Vibrio vulnificus infection, you can access the U.S. Patent Office archive via the Internet at no cost to you. This archive is available at the following Web address: **http://www.uspto.gov/main/patents.htm**. Under "Services," click on "Search Patents." You will see two broad options: (1) Patent Grants, and (2) Patent Applications. To see a list of granted patents, perform the following steps: Under "Patent Grants," click "Quick Search." Then, type "Vibrio vulnificus infection" (or synonyms) into the "Term 1" box. After clicking on the search button, scroll down to see the various patents which have been granted to date on Vibrio vulnificus infection. You can also use this procedure to view pending patent applications concerning Vibrio vulnificus infection. Simply go back to the following Web address: **http://www.uspto.gov/main/patents.htm**. Under "Services," click on "Search Patents." Select "Quick Search" under "Patent Applications." Then proceed with the steps listed above.

Vocabulary Builder

Hybridization: The genetic process of crossbreeding to produce a hybrid. Hybrid nucleic acids can be formed by nucleic acid hybridization of DNA and RNA molecules. Protein hybridization allows for hybrid proteins to be formed from polypeptide chains. [NIH]

[22] This has been a common practice outside the United States prior to December 2000.

CHAPTER 5. BOOKS ON VIBRIO VULNIFICUS INFECTION

Overview

This chapter provides bibliographic book references relating to Vibrio vulnificus infection. You have many options to locate books on Vibrio vulnificus infection. The simplest method is to go to your local bookseller and inquire about titles that they have in stock or can special order for you. Some patients, however, feel uncomfortable approaching their local booksellers and prefer online sources (e.g. **www.amazon.com** and **www.bn.com**). In addition to online booksellers, excellent sources for book titles on Vibrio vulnificus infection include the Combined Health Information Database and the National Library of Medicine. Once you have found a title that interests you, visit your local public or medical library to see if it is available for loan.

Book Summaries: Federal Agencies

The Combined Health Information Database collects various book abstracts from a variety of healthcare institutions and federal agencies. To access these summaries, go to **http://chid.nih.gov/detail/detail.html**. You will need to use the "Detailed Search" option. To find book summaries, use the drop boxes at the bottom of the search page where "You may refine your search by." Select the dates and language you prefer. For the format option, select "Monograph/Book." Now type "Vibrio vulnificus infection" (or synonyms) into the "For these words:" box. You will only receive results on books. You should check back periodically with this database which is updated every 3 months. The following is a typical result when searching for books on Vibrio vulnificus infection:

- **Oral and Cutaneous Manifestations of Hematogenously Disseminated Systemic Infections: A Monograph**

  Source: Research Triangle Park, NC: Glaxo, Inc. 1993. 79 p.

  Contact: Available from Glaxo-Wellcome Education Resource Center. 5 Moore Drive, Research Triangle Park, NC 27709. (800) 824-2896. Price: Single copy free. Stock Number GVL251.

  Summary: This monograph describes oral and dermatologic manifestations resulting from systemic infections. Written as a continuing education tool for physicians, the monograph features 26 sections, each of which includes a description of dermatologic manifestations, other clinical features, laboratory findings, and epidemiologic factors. Diseases covered include AIDS, blastomycosis, candidiasis, coccidioidomycosis, cryptococcoses, erythema infectiousum (Fifth disease), gonococcemia, gram-negative bacterial sepsis, hand-foot-and-mouth disease, infectious mononucleosis, infective endocarditis, Kawasaki syndrome, leprosy, lyme disease, meningococcemia, Rocky Mountain spotted fever, roseola, rubella (German measles), rubeola (measles), scarlet fever, secondary (disseminated) syphilis, staphylococcal scalded skin syndrome, toxic shock syndrome, typhoid fever, varicella (chickenpox), and Vibrio vulnificus infection. Each section is illustrated with full-color photographs depicting patients with manifestations of the disease under consideration. The monograph includes a glossary of illustrations to help with diagnosis and classification. The monograph concludes with a self-test and instructions for receiving continuing medical education credits. A subject index is also included. 12 references.

Book Summaries: Online Booksellers

Commercial Internet-based booksellers, such as Amazon.com and Barnes & Noble.com, offer summaries which have been supplied by each title's publisher. Some summaries also include customer reviews. Your local bookseller may have access to in-house and commercial databases that index all published books (e.g. Books in Print®).

The National Library of Medicine Book Index

The National Library of Medicine at the National Institutes of Health has a massive database of books published on healthcare and biomedicine. Go to the following Internet site, **http://locatorplus.gov/**, and then select "Search LOCATORplus." Once you are in the search area, simply type "Vibrio vulnificus infection" (or synonyms) into the search box, and select "books only." From there, results can be sorted by publication date, author, or relevance. The following was recently catalogued by the National Library of Medicine:[23]

- **Annotated bibliography on classical vibrio cholerae.** Author: Greenough, William B; Year: 1985; Dhaka, Bangladesh: International Centre for Diarrhoeal Disease Research, Bangladesh, c1985
- **Assay of isolation and differential identification of some animal vibrios and of elucidation of their pathological significance.** Author: Elazhary, M. A. S. Y; Year: 1968; [Gent, 1968]
- **Cholera and the ecology of Vibrio cholerae.** Author: edited by B.S. Drasar and B.D. Forrest; Year: 1996; London; New York: Chapman & Hall, 1996; ISBN: 0412612208 (alk. paper) http://www.amazon.com/exec/obidos/ASIN/0412612208/icongroupinterna
- **Defense of mucosal surfaces: pathogenesis, immunity and vaccines.** Author: edited by J.-P. Kraehenbuhl, M.R. Neutra; Year: 1999; Berlin; New York: Springer, 1999; ISBN: 3540647309 (alk. paper) http://www.amazon.com/exec/obidos/ASIN/3540647309/icongroupinterna
- **Vibrio cholerae and cholera: molecular to global perspectives.** Author: edited by I. Kaye Wachsmuth, Paul A. Blake, Ørjan Olsvik; Year: 1994; Washington, D.C.: ASM Press, c1994; ISBN: 1555810675 http://www.amazon.com/exec/obidos/ASIN/1555810675/icongroupinterna

[23] In addition to LOCATORPlus, in collaboration with authors and publishers, the National Center for Biotechnology Information (NCBI) is adapting biomedical books for the Web. The books may be accessed in two ways: (1) by searching directly using any search term or phrase (in the same way as the bibliographic database PubMed), or (2) by following the links to PubMed abstracts. Each PubMed abstract has a "Books" button that displays a facsimile of the abstract in which some phrases are hypertext links. These phrases are also found in the books available at NCBI. Click on hyperlinked results in the list of books in which the phrase is found. Currently, the majority of the links are between the books and PubMed. In the future, more links will be created between the books and other types of information, such as gene and protein sequences and macromolecular structures. See **http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Books.**

- **Vibrio cholerae.** Author: William B. Greenough; Year: 1979; Dacca, Bangladesh: International Centre for Diarrhoeal Disease Research, Bangladesh, [1979]
- **Vibrio fetus; a bibliography.** Author: Osborne, J. Clark; Year: 1971; Blacksburg, Virginia Polytechnic Institute and State Univ., 1971
- **Vibrio parahaemolyticus: a causative bacterium of food poisoning.** Author: Toshio Miwatani, Yoshifumi Takeda; Year: 1976; Tokyo: Saikon Pub. Co., 1976
- **Vibrios in the environment.** Author: edited by Rita R. Colwell; associate editors, Henry B. Bradford, Jr. ... [et al.]; technical editor, Mary Beth Hatem; Year: 1984; New York: Wiley, c1984; ISBN: 0471873438 http://www.amazon.com/exec/obidos/ASIN/0471873438/icongroupinterna

Chapters on Vibrio Vulnificus Infection

Frequently, Vibrio vulnificus infection will be discussed within a book, perhaps within a specific chapter. In order to find chapters that are specifically dealing with Vibrio vulnificus infection, an excellent source of abstracts is the Combined Health Information Database. You will need to limit your search to book chapters and Vibrio vulnificus infection using the "Detailed Search" option. Go directly to the following hyperlink: **http://chid.nih.gov/detail/detail.html**. To find book chapters, use the drop boxes at the bottom of the search page where "You may refine your search by." Select the dates and language you prefer, and the format option "Book Chapter." By making these selections and typing in "Vibrio vulnificus infection" (or synonyms) into the "For these words:" box, you will only receive results on chapters in books. The following is a typical result when searching for book chapters on Vibrio vulnificus infection:

- **Food-Borne Illness**

  Source: in Hagan, P.T., ed. Mayo Clinic Guide to Self-Care: Answers for Everyday Health Problems. New York, NY: Kensington Publishers. 1999. p. 26-27.

  Contact: Available from Mayo Clinic. 200 First Street, S.W., Rochester, MN 55905. (800) 291-1128 or (507) 284-2511. Fax (507) 284-0161. Website: www.mayo.edu. Price: $16.95 plus shipping and handling. ISBN: 0962786578.

  Summary: Foodborne illness is a growing problem in the U.S. This chapter on foodborne illness is from a self care handbook on everyday

health problems published by the Mayo Clinic. The handbook offers readers a guide to symptoms, diagnosis, and treatment for common problems (particularly self care strategies and tips for handling these problems in children). All foods naturally contain small amounts of bacteria. When food is poorly handled, improperly cooked, or inadequately stored, bacteria can multiply in great enough numbers to cause illness. Parasites, viruses, and chemicals can also contaminate food, but foodborne illness from these sources is less common. Eating contaminated food can result in illness, depending on the organism, the amount of exposure, one's age, and health status. As people age, their immune cells may not respond as quickly and effectively to infectious organisms. Young children are at increased risk of illness because their immune systems haven't developed fully. Conditions such as diabetes, AIDS, and cancer treatment also reduce the immune response, making one more susceptible to foodborne illness. The chapter briefly lists self care strategies, particularly for handling short lived (less than 12 hours) food poisoning. One section cautions readers about botulism, a potentially fatal food poisoning. A side bar reviews how to handle food safely. The chapter concludes with a chart of common troublesome bacteria, how each is spread, the symptoms caused by infection, and prevention strategies. Bacteria included are Campylobacter jejuni, Clostridium perfringens, Escherichia coli 0157:H7, Salmonella, Staphylococcus aureus, and Vibrio vulnificus. The book is focused on how to prevent illness, how to detect illness before it becomes a serious and costly problem, and how to avoid unnecessary trips to the clinic or emergency room. 1 table.

General Home References

In addition to references for Vibrio vulnificus infection, you may want a general home medical guide that spans all aspects of home healthcare. The following list is a recent sample of such guides (sorted alphabetically by title; hyperlinks provide rankings, information, and reviews at Amazon.com):

- **The Bacteria Menace: Todays Emerging Infections and How to Protect Yourself** by Skye Weintraub; Paperback - 350 pages (May 2002), Woodland Publishing; ISBN: 1580543529; **http://www.amazon.com/exec/obidos/ASIN/1580543529/icongroupinterna**
- **Bacterial Infections** by Axel Dalhoff (Editor); Paperback (April 1999), S. Karger Publishing; ISBN: 380556841X; **http://www.amazon.com/exec/obidos/ASIN/380556841X/icongroupinterna**

- **Encyclopedia of Infectious Diseases (Encyclopedia of Infectious Diseases, 1998)** by Carol Turkington, Bonnie Ashby; Library Binding - 384 pages (September 1998), Facts on File, Inc.; ISBN: 0816035121; **http://www.amazon.com/exec/obidos/ASIN/0816035121/icongroupinterna**
- **Epidemic! The World of Infectious Disease** by Rob Desalle (Editor), American Museum of Natural History; Paperback - 246 pages, 1st edition (September 1999), New Press; ISBN: 1565845463; **http://www.amazon.com/exec/obidos/ASIN/1565845463/icongroupinterna**
- **I Know How We Fight Germs (Sam's Science)** by Kate Rowan, et al; School & Library Binding - 32 pages (January 1999), Candlewick Press; ISBN: 0763605034; **http://www.amazon.com/exec/obidos/ASIN/0763605034/icongroupinterna**
- **Outbreak Alert: Responding to the Increasing Threat of Infectious Diseases** by Jason Eberhart-Phillips, M.D.; Paperback - 292 pages (July 2000), New Harbinger Publications; ISBN: 1572242019; **http://www.amazon.com/exec/obidos/ASIN/1572242019/icongroupinterna**

Vocabulary Builder

Bacterial Infections: Infections by bacteria, general or unspecified. [NIH]

Blastomycosis: A fungal infection that may appear in two forms: 1) a primary lesion characterized by the formation of a small cutaneous nodule and small nodules along the lymphatics that may heal within several months; and 2) chronic granulomatous lesions characterized by thick crusts, warty growths, and unusual vascularity and infection in the middle or upper lobes of the lung. [NIH]

Candidiasis: Infection with a fungus of the genus Candida. It is usually a superficial infection of the moist cutaneous areas of the body, and is generally caused by C. albicans; it most commonly involves the skin (dermatocandidiasis), oral mucous membranes (thrush, def. 1), respiratory tract (bronchocandidiasis), and vagina (vaginitis). Rarely there is a systemic infection or endocarditis. Called also moniliasis, candidosis, oidiomycosis, and formerly blastodendriosis. [EU]

Clostridium: A genus of motile or nonmotile gram-positive bacteria of the family bacillaceae. Many species have been identified with some being pathogenic. They occur in water, soil, and in the intestinal tract of humans and lower animals. [NIH]

Cutaneous: Pertaining to the skin; dermal; dermic. [EU]

Endocarditis: Exudative and proliferative inflammatory alterations of the

endocardium, characterized by the presence of vegetations on the surface of the endocardium or in the endocardium itself, and most commonly involving a heart valve, but sometimes affecting the inner lining of the cardiac chambers or the endocardium elsewhere. It may occur as a primary disorder or as a complication of or in association with another disease. [EU]

Erythema: A name applied to redness of the skin produced by congestion of the capillaries, which may result from a variety of causes, the etiology or a specific type of lesion often being indicated by a modifying term. [EU]

Leprosy: A chronic granulomatous infection caused by mycobacterium leprae. The granulomatous lesions are manifested in the skin, the mucous membranes, and the peripheral nerves. Two polar or principal types are lepromatous and tuberculoid. [NIH]

Molecular: Of, pertaining to, or composed of molecules : a very small mass of matter. [EU]

Mononucleosis: The presence of an abnormally large number of mononuclear leucocytes (monocytes) in the blood. The term is often used alone to refer to infectious mononucleosis. [EU]

Oral: Pertaining to the mouth, taken through or applied in the mouth, as an oral medication or an oral thermometer. [EU]

Rubella: An acute, usually benign, infectious disease caused by a togavirus and most often affecting children and nonimmune young adults, in which the virus enters the respiratory tract via droplet nuclei and spreads to the lymphatic system. It is characterized by a slight cold, sore throat, and fever, followed by enlargement of the postauricular, suboccipital, and cervical lymph nodes, and the appearances of a fine pink rash that begins on the head and spreads to become generalized. Called also German measles, roetln, röteln, and three-day measles, and rubeola in French and Spanish. [EU]

Staphylococcus: A genus of gram-positive, facultatively anaerobic, coccoid bacteria. Its organisms occur singly, in pairs, and in tetrads and characteristically divide in more than one plane to form irregular clusters. Natural populations of Staphylococcus are membranes of warm-blooded animals. Some species are opportunistic pathogens of humans and animals. [NIH]

Syphilis: A contagious venereal disease caused by the spirochete treponema pallidum. [NIH]

Vaccine: A suspension of attenuated or killed microorganisms (bacteria, viruses, or rickettsiae), administered for the prevention, amelioration or treatment of infectious diseases. [EU]

CHAPTER 6. MULTIMEDIA ON VIBRIO VULNIFICUS INFECTION

Overview

Information on Vibrio vulnificus infection can come in a variety of formats. Among multimedia sources, video productions, slides, audiotapes, and computer databases are often available. In this chapter, we show you how to keep current on multimedia sources of information on Vibrio vulnificus infection. We start with sources that have been summarized by federal agencies, and then show you how to find bibliographic information catalogued by the National Library of Medicine. If you see an interesting item, visit your local medical library to check on the availability of the title.

Video Recordings

Most diseases do not have a video dedicated to them. If they do, they are often rather technical in nature. An excellent source of multimedia information on Vibrio vulnificus infection is the Combined Health Information Database. You will need to limit your search to "video recording" and "Vibrio vulnificus infection" using the "Detailed Search" option. Go to the following hyperlink: **http://chid.nih.gov/detail/detail.html**. To find video productions, use the drop boxes at the bottom of the search page where "You may refine your search by." Select the dates and language you prefer, and the format option "Videorecording (videotape, videocassette, etc.)." By making these selections and typing "Vibrio vulnificus infection" (or synonyms) into the "For these words:" box, you will only receive results on video productions. The following is a typical result when searching for video recordings on Vibrio vulnificus infection:

- **Newly Recognized Infectious Diseases**

  Source: Atlanta, GA: Emory University Office of Medical Television. 1990.

  Contact: Available from Robert W. Woodruff Health Sciences Center, Emory University. Office of Medical Television, 1364 Clifton Road, Box M-16, Atlanta, GA 30322. (404) 727-9797. Fax (404) 727-9798. Price: $75 (as of 1996). Also available for rental; contact producer for current fee. Item Number 90-21.

  Summary: This videotape program presents a lecture by Dr. Jonas Shulman on newly described or recognized infectious diseases. Diseases include Chlamidiae pneumonia (the TWAR agent), Vibrio vulnificus, Parvovirus B-19, DF-2 (which causes devastating infections related to dog bites), a newly recognized manifestation of gastrointestinal infection with E coli (hemorrhagic enterocolitis, sometimes complicated with the hemolytic uremic syndrome), cat scratch disease (an old disease that has gained attention in association with HIV infection), and Yersinia enterocolitica, causing diarrhea and pseudo-appendicitis. Dr. Shulman also discusses the clinical manifestations of acute HIV infection. For each disease, Dr. Shulman presents clinical cases. (AA-M).

Bibliography: Multimedia on Vibrio Vulnificus Infection

The National Library of Medicine is a rich source of information on healthcare-related multimedia productions including slides, computer software, and databases. To access the multimedia database, go to the following Web site: **http://locatorplus.gov/**. Select "Search LOCATORplus." Once in the search area, simply type in Vibrio vulnificus infection (or synonyms). Then, in the option box provided below the search box, select "Audiovisuals and Computer Files." From there, you can choose to sort results by publication date, author, or relevance. The following multimedia has been indexed on Vibrio vulnificus infection. For more information, follow the hyperlink indicated:

- **Cholera can be conquered.** Source: [Byron; presented by] the United States Navy; Year: 1946; Format: Motion picture; United States: Byron, c1946
- **Cholera today . Part II: Practical laboratory diagnosis.** Source: Agency for International Development and National Institutes of Health; produced by National Medical Audiovisual Center; Year: 1966; Format: Motion picture; [Atlanta]: National Medical Audiovisual Center, [1966]

- **Cholera.** Source: Instructional Systems Division, Center for Disease Control; Year: 1974; Format: Slide; [Atlanta]: The Center, [1974?]

Vocabulary Builder

Appendicitis: Acute inflammation of the vermiform appendix. [NIH]

Enterocolitis: Inflammation involving both the small intestine and the colon; see also enteritis. [EU]

Parvovirus: A genus of the family parvoviridae, subfamily parvovirinae, infecting a variety of vertebrates including humans. Parvoviruses are responsible for a number of important diseases but also can be non-pathogenic in certain hosts. The type species is mice minute virus. [NIH]

Pneumonia: Inflammation of the lungs with consolidation. [EU]

Yersinia: A genus of gram-negative, facultatively anaerobic rod- to coccobacillus-shaped bacteria that occurs in a broad spectrum of habitats. [NIH]

CHAPTER 7. PERIODICALS AND NEWS ON VIBRIO VULNIFICUS INFECTION

Overview

Keeping up on the news relating to Vibrio vulnificus infection can be challenging. Subscribing to targeted periodicals can be an effective way to stay abreast of recent developments on Vibrio vulnificus infection. Periodicals include newsletters, magazines, and academic journals.

In this chapter, we suggest a number of news sources and present various periodicals that cover Vibrio vulnificus infection beyond and including those which are published by patient associations mentioned earlier. We will first focus on news services, and then on periodicals. News services, press releases, and newsletters generally use more accessible language, so if you do chose to subscribe to one of the more technical periodicals, make sure that it uses language you can easily follow.

News Services & Press Releases

Well before articles show up in newsletters or the popular press, they may appear in the form of a press release or a public relations announcement. One of the simplest ways of tracking press releases on Vibrio vulnificus infection is to search the news wires. News wires are used by professional journalists, and have existed since the invention of the telegraph. Today, there are several major "wires" that are used by companies, universities, and other organizations to announce new medical breakthroughs. In the following sample of sources, we will briefly describe how to access each service. These services only post recent news intended for public viewing.

PR Newswire

Perhaps the broadest of the wires is PR Newswire Association, Inc. To access this archive, simply go to **http://www.prnewswire.com**. Below the search box, select the option "The last 30 days." In the search box, type "Vibrio vulnificus infection" or synonyms. The search results are shown by order of relevance. When reading these press releases, do not forget that the sponsor of the release may be a company or organization that is trying to sell a particular product or therapy. Their views, therefore, may be biased.

Reuters

The Reuters' Medical News database can be very useful in exploring news archives relating to Vibrio vulnificus infection. While some of the listed articles are free to view, others can be purchased for a nominal fee. To access this archive, go to **http://www.reutershealth.com/frame2/arch.html** and search by "Vibrio vulnificus infection" (or synonyms). The following was recently listed in this archive for Vibrio vulnificus infection:

- **Raw Oysters Implicated In Vibrio Vulnificus Infection Outbreak**
  Source: Reuters Medical News
  Date: July 26, 1996
  http://www.reuters.gov/archive/1996/07/26/professional/links/19960726epid003.html
- **Vibrio Vulnificus Infection Worse In Alcoholics**
  Source: Reuters Medical News
  Date: May 23, 1996
  http://www.reuters.gov/archive/1996/05/23/professional/links/19960523clin006.html

The NIH

Within MEDLINEplus, the NIH has made an agreement with the New York Times Syndicate, the AP News Service, and Reuters to deliver news that can be browsed by the public. Search news releases at **http://www.nlm.nih.gov/medlineplus/alphanews_a.html.** MEDLINEplus allows you to browse across an alphabetical index. Or you can search by date at **http://www.nlm.nih.gov/medlineplus/newsbydate.html**. Often, news items are indexed by MEDLINEplus within their search engine.

Business Wire

Business Wire is similar to PR Newswire. To access this archive, simply go to **http://www.businesswire.com**. You can scan the news by industry category or company name.

Internet Wire

Internet Wire is more focused on technology than the other wires. To access this site, go to **http://www.internetwire.com** and use the "Search Archive" option. Type in "Vibrio vulnificus infection" (or synonyms). As this service is oriented to technology, you may wish to search for press releases covering diagnostic procedures or tests that you may have read about.

Search Engines

Free-to-view news can also be found in the news section of your favorite search engines (see the health news page at Yahoo: **http://dir.yahoo.com/Health/News_and_Media/,** or use this Web site's general news search page **http://news.yahoo.com/.** Type in "Vibrio vulnificus infection" (or synonyms). If you know the name of a company that is relevant to Vibrio vulnificus infection, you can go to any stock trading Web site (such as **www.etrade.com**) and search for the company name there. News items across various news sources are reported on indicated hyperlinks.

BBC

Covering news from a more European perspective, the British Broadcasting Corporation (BBC) allows the public free access to their news archive located at **http://www.bbc.co.uk/**. Search by "Vibrio vulnificus infection" (or synonyms).

Newsletter Articles

If you choose not to subscribe to a newsletter, you can nevertheless find references to newsletter articles. We recommend that you use the Combined Health Information Database, while limiting your search criteria to

"newsletter articles." Again, you will need to use the "Detailed Search" option. Go to the following hyperlink: **http://chid.nih.gov/detail/detail.html**. Go to the bottom of the search page where "You may refine your search by." Select the dates and language that you prefer. For the format option, select "Newsletter Article."

By making these selections, and typing in "Vibrio vulnificus infection" (or synonyms) into the "For these words:" box, you will only receive results on newsletter articles. You should check back periodically with this database as it is updated every 3 months. The following is a typical result when searching for newsletter articles on Vibrio vulnificus infection:

- **Food Safety Guide**

  Source: Nutrition Action Healthletter. 26(8): 1, 3-9. October 1999.

  Contact: Available from Center for Science in the Public Interest. 1875 Connecticut Avenue, N.W., Suite 300, Washington, DC 20009-5728. (202) 332-9110. Fax (202) 265-4954. Website: www.cspinet.org.

  Summary: This newsletter article offers a food safety guide to help consumers avoid episodes of food poisoning. The authors first review some of the changes in the food safety field, including new pathogens to deal with, a more centrally produced and global food supply, and changes in the ways food animals are raised. The authors then review the two families of bacteria of concern: spoilage bacteria that cause foods to smell and taste bad; and disease causing bacteria that do not usually change the taste, smell, or appearance of food, but can make people sick. The body of the article discusses each category of food, including poultry, seafood, dairy, eggs, fruits and vegetables, juice and cider, prepared foods and salads, hot dogs and deli meats. In each category, the authors describe the food handling issues, the types of infections that are possible, and experiences of people who got sick. Sections headed What to Do offer specific strategies for shopping, handling fresh fruits, preparing foods, cooking meats, staying informed, avoiding raw foods, traveling, and eating at restaurants. One sidebar lists the symptoms of food poisoning and how to know when to contact a health care provider. The authors recommend the website that refers readers to the government food safety sites (www.foodsafety.gov). The article concludes with a chart summarizing the pathogens, their possible symptoms, foods that have caused outbreaks, how soon the symptoms typically strike, and how long the illness lasts. Pathogens covered are Campylobacter, Ciguatera, Clostridium botulinum, Cyclospora, E. coli O157:H7, hepatitis A, Listeria, Norwalk virus, Salmonella, Scombrotoxin, Vibrio parahaemolyticus, and Vibrio vulnificus. 1 table.

Academic Periodicals covering Vibrio Vulnificus Infection

Academic periodicals can be a highly technical yet valuable source of information on Vibrio vulnificus infection. We have compiled the following list of periodicals known to publish articles relating to Vibrio vulnificus infection and which are currently indexed within the National Library of Medicine's PubMed database (follow hyperlinks to view more information, summaries, etc., for each). In addition to these sources, to keep current on articles written on Vibrio vulnificus infection published by any of the periodicals listed below, you can simply follow the hyperlink indicated or go to the following Web site: **www.ncbi.nlm.nih.gov/pubmed**. Type the periodical's name into the search box to find the latest studies published.

If you want complete details about the historical contents of a periodical, you can also visit **http://www.ncbi.nlm.nih.gov/entrez/jrbrowser.cgi**. Here, type in the name of the journal or its abbreviation, and you will receive an index of published articles. At **http://locatorplus.gov/** you can retrieve more indexing information on medical periodicals (e.g. the name of the publisher). Select the button "Search LOCATORplus." Then type in the name of the journal and select the advanced search option "Journal Title Search." The following is a sample of periodicals which publish articles on Vibrio vulnificus infection:

- **Applied and Environmental Microbiology. (Appl Environ Microbiol)**
  http://www.ncbi.nlm.nih.gov/entrez/jrbrowser.cgi?field=0&regexp=Applied+and+Environmental+Microbiology&dispmax=20&dispstart=0

- **Infection and Immunity. (Infect Immun)**
  http://www.ncbi.nlm.nih.gov/entrez/jrbrowser.cgi?field=0&regexp=Infection+and+Immunity&dispmax=20&dispstart=0

- **Journal of Applied Microbiology. (J Appl Microbiol)**
  http://www.ncbi.nlm.nih.gov/entrez/jrbrowser.cgi?field=0&regexp=Journal+of+Applied+Microbiology&dispmax=20&dispstart=0

- **Journal of Clinical Microbiology. (J Clin Microbiol)**
  http://www.ncbi.nlm.nih.gov/entrez/jrbrowser.cgi?field=0&regexp=Journal+of+Clinical+Microbiology&dispmax=20&dispstart=0

- **Journal of Microbiological Methods. (J Microbiol Methods)**
  http://www.ncbi.nlm.nih.gov/entrez/jrbrowser.cgi?field=0&regexp=Journal+of+Microbiological+Methods&dispmax=20&dispstart=0

- **Microbial Pathogenesis. (Microb Pathog)**
  http://www.ncbi.nlm.nih.gov/entrez/jrbrowser.cgi?field=0&regexp=Microbial+Pathogenesis&dispmax=20&dispstart=0

CHAPTER 8. PHYSICIAN GUIDELINES AND DATABASES

Overview

Doctors and medical researchers rely on a number of information sources to help patients with their conditions. Many will subscribe to journals or newsletters published by their professional associations or refer to specialized textbooks or clinical guides published for the medical profession. In this chapter, we focus on databases and Internet-based guidelines created or written for this professional audience.

NIH Guidelines

For the more common diseases, The National Institutes of Health publish guidelines that are frequently consulted by physicians. Publications are typically written by one or more of the various NIH Institutes. For physician guidelines, commonly referred to as "clinical" or "professional" guidelines, you can visit the following Institutes:

- Office of the Director (OD); guidelines consolidated across agencies available at **http://www.nih.gov/health/consumer/conkey.htm**
- National Institute of General Medical Sciences (NIGMS); fact sheets available at **http://www.nigms.nih.gov/news/facts/**
- National Library of Medicine (NLM); extensive encyclopedia (A.D.A.M., Inc.) with guidelines: **http://www.nlm.nih.gov/medlineplus/healthtopics.html**
- National Institute of Allergy and Infectious Diseases (NIAID); guidelines available at **http://www.niaid.nih.gov/publications/**

- Centers for Disease Control and Prevention; various fact sheets on infectious diseases available at **http://www.cdc.gov/health/diseases.htm**

NIH Databases

In addition to the various Institutes of Health that publish professional guidelines, the NIH has designed a number of databases for professionals.[24] Physician-oriented resources provide a wide variety of information related to the biomedical and health sciences, both past and present. The format of these resources varies. Searchable databases, bibliographic citations, full text articles (when available), archival collections, and images are all available. The following are referenced by the National Library of Medicine:[25]

- **Bioethics:** Access to published literature on the ethical, legal and public policy issues surrounding healthcare and biomedical research. This information is provided in conjunction with the Kennedy Institute of Ethics located at Georgetown University, Washington, D.C.: **http://www.nlm.nih.gov/databases/databases_bioethics.html**
- **HIV/AIDS Resources:** Describes various links and databases dedicated to HIV/AIDS research: **http://www.nlm.nih.gov/pubs/factsheets/aidsinfs.html**
- **NLM Online Exhibitions:** Describes "Exhibitions in the History of Medicine": **http://www.nlm.nih.gov/exhibition/exhibition.html**. Additional resources for historical scholarship in medicine: **http://www.nlm.nih.gov/hmd/hmd.html**
- **Biotechnology Information:** Access to public databases. The National Center for Biotechnology Information conducts research in computational biology, develops software tools for analyzing genome data, and disseminates biomedical information for the better understanding of molecular processes affecting human health and disease: **http://www.ncbi.nlm.nih.gov/**
- **Population Information:** The National Library of Medicine provides access to worldwide coverage of population, family planning, and related health issues, including family planning technology and programs, fertility, and population law and policy: **http://www.nlm.nih.gov/databases/databases_population.html**

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[24] Remember, for the general public, the National Library of Medicine recommends the databases referenced in MEDLINE*plus* (**http://medlineplus.gov/** or **http://www.nlm.nih.gov/medlineplus/databases.html**).

[25] See **http://www.nlm.nih.gov/databases/databases.html**.

- **Cancer Information:** Access to caner-oriented databases: **http://www.nlm.nih.gov/databases/databases_cancer.html**
- **Profiles in Science:** Offering the archival collections of prominent twentieth-century biomedical scientists to the public through modern digital technology: **http://www.profiles.nlm.nih.gov/**
- **Chemical Information:** Provides links to various chemical databases and references: **http://sis.nlm.nih.gov/Chem/ChemMain.html**
- **Clinical Alerts:** Reports the release of findings from the NIH-funded clinical trials where such release could significantly affect morbidity and mortality: **http://www.nlm.nih.gov/databases/alerts/clinical_alerts.html**
- **Space Life Sciences:** Provides links and information to space-based research (including NASA): **http://www.nlm.nih.gov/databases/databases_space.html**
- **MEDLINE:** Bibliographic database covering the fields of medicine, nursing, dentistry, veterinary medicine, the healthcare system, and the pre-clinical sciences: **http://www.nlm.nih.gov/databases/databases_medline.html**
- **Toxicology and Environmental Health Information (TOXNET):** Databases covering toxicology and environmental health: **http://sis.nlm.nih.gov/Tox/ToxMain.html**
- **Visible Human Interface:** Anatomically detailed, three-dimensional representations of normal male and female human bodies: **http://www.nlm.nih.gov/research/visible/visible_human.html**

While all of the above references may be of interest to physicians who study and treat Vibrio vulnificus infection, the following are particularly noteworthy.

The NLM Gateway[26]

The NLM (National Library of Medicine) Gateway is a Web-based system that lets users search simultaneously in multiple retrieval systems at the U.S. National Library of Medicine (NLM). It allows users of NLM services to initiate searches from one Web interface, providing "one-stop searching" for many of NLM's information resources or databases.[27] One target audience

[26] Adapted from NLM: **http://gateway.nlm.nih.gov/gw/Cmd?Overview.x**.

[27] The NLM Gateway is currently being developed by the Lister Hill National Center for Biomedical Communications (LHNCBC) at the National Library of Medicine (NLM) of the National Institutes of Health (NIH).

for the Gateway is the Internet user who is new to NLM's online resources and does not know what information is available or how best to search for it. This audience may include physicians and other healthcare providers, researchers, librarians, students, and, increasingly, patients, their families, and the public.[28] To use the NLM Gateway, simply go to the search site at **http://gateway.nlm.nih.gov/gw/Cmd**. Type "Vibrio vulnificus infection" (or synonyms) into the search box and click "Search." The results will be presented in a tabular form, indicating the number of references in each database category.

Results Summary

Category	Items Found
Journal Articles	345044
Books / Periodicals / Audio Visual	2565
Consumer Health	293
Meeting Abstracts	3093
Other Collections	100
Total	351095

HSTAT[29]

HSTAT is a free, Web-based resource that provides access to full-text documents used in healthcare decision-making.[30] HSTAT's audience includes healthcare providers, health service researchers, policy makers, insurance companies, consumers, and the information professionals who serve these groups. HSTAT provides access to a wide variety of publications, including clinical practice guidelines, quick-reference guides for clinicians, consumer health brochures, evidence reports and technology assessments from the Agency for Healthcare Research and Quality (AHRQ), as well as

[28] Other users may find the Gateway useful for an overall search of NLM's information resources. Some searchers may locate what they need immediately, while others will utilize the Gateway as an adjunct tool to other NLM search services such as PubMed® and MEDLINEplus®. The Gateway connects users with multiple NLM retrieval systems while also providing a search interface for its own collections. These collections include various types of information that do not logically belong in PubMed, LOCATORplus, or other established NLM retrieval systems (e.g., meeting announcements and pre-1966 journal citations). The Gateway will provide access to the information found in an increasing number of NLM retrieval systems in several phases.

[29] Adapted from HSTAT: **http://www.nlm.nih.gov/pubs/factsheets/hstat.html**.

[30] The HSTAT URL is **http://hstat.nlm.nih.gov/**.

AHRQ's Put Prevention Into Practice.[31] Simply search by "Vibrio vulnificus infection" (or synonyms) at the following Web site: **http://text.nlm.nih.gov**.

Coffee Break: Tutorials for Biologists[32]

Some patients may wish to have access to a general healthcare site that takes a scientific view of the news and covers recent breakthroughs in biology that may one day assist physicians in developing treatments. To this end, we recommend "Coffee Break," a collection of short reports on recent biological discoveries. Each report incorporates interactive tutorials that demonstrate how bioinformatics tools are used as a part of the research process. Currently, all Coffee Breaks are written by NCBI staff.[33] Each report is about 400 words and is usually based on a discovery reported in one or more articles from recently published, peer-reviewed literature.[34] This site has new articles every few weeks, so it can be considered an online magazine of sorts, and intended for general background information. You can access the Coffee Break Web site at **http://www.ncbi.nlm.nih.gov/Coffeebreak/**.

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[31] Other important documents in HSTAT include: the National Institutes of Health (NIH) Consensus Conference Reports and Technology Assessment Reports; the HIV/AIDS Treatment Information Service (ATIS) resource documents; the Substance Abuse and Mental Health Services Administration's Center for Substance Abuse Treatment (SAMHSA/CSAT) Treatment Improvement Protocols (TIP) and Center for Substance Abuse Prevention (SAMHSA/CSAP) Prevention Enhancement Protocols System (PEPS); the Public Health Service (PHS) Preventive Services Task Force's *Guide to Clinical Preventive Services*; the independent, nonfederal Task Force on Community Services *Guide to Community Preventive Services*; and the Health Technology Advisory Committee (HTAC) of the Minnesota Health Care Commission (MHCC) health technology evaluations.

[32] Adapted from **http://www.ncbi.nlm.nih.gov/Coffeebreak/Archive/FAQ.html**.

[33] The figure that accompanies each article is frequently supplied by an expert external to NCBI, in which case the source of the figure is cited. The result is an interactive tutorial that tells a biological story.

[34] After a brief introduction that sets the work described into a broader context, the report focuses on how a molecular understanding can provide explanations of observed biology and lead to therapies for diseases. Each vignette is accompanied by a figure and hypertext links that lead to a series of pages that interactively show how NCBI tools and resources are used in the research process.

Other Commercial Databases

In addition to resources maintained by official agencies, other databases exist that are commercial ventures addressing medical professionals. Here are a few examples that may interest you:

- **CliniWeb International:** Index and table of contents to selected clinical information on the Internet; see **http://www.ohsu.edu/cliniweb/**.
- **Image Engine:** Multimedia electronic medical record system that integrates a wide range of digitized clinical images with textual data stored in the University of Pittsburgh Medical Center's MARS electronic medical record system; see the following Web site: **http://www.cml.upmc.edu/cml/imageengine/imageEngine.html**.
- **Medical World Search:** Searches full text from thousands of selected medical sites on the Internet; see **http://www.mwsearch.com/**.
- **MedWeaver:** Prototype system that allows users to search differential diagnoses for any list of signs and symptoms, to search medical literature, and to explore relevant Web sites; see **http://www.med.virginia.edu/~wmd4n/medweaver.html**.
- **Metaphrase:** Middleware component intended for use by both caregivers and medical records personnel. It converts the informal language generally used by caregivers into terms from formal, controlled vocabularies; see the following Web site: **http://www.lexical.com/Metaphrase.html**.

Specialized References

The following books are specialized references written for professionals interested in Vibrio vulnificus infection (sorted alphabetically by title, hyperlinks provide rankings, information, and reviews at Amazon.com):

- **2002 Pocket Book of Infectious Disease Therapy** by John G. Bartlett; Paperback - 348 pages, 11th edition (November 15, 2001), Lippincott, Williams & Wilkins Publishers; ISBN: 0781734320; **http://www.amazon.com/exec/obidos/ASIN/0781734320/icongroupinterna**
- **Bacterial Infections of Humans: Epidemiology and Control** by Alfred S. Evans (Editor), et al; Hardcover - 887 pages, 3rd edition (July 15, 1998), Plenum Publishing Corporation; ISBN: 0306453207; **http://www.amazon.com/exec/obidos/ASIN/0306453207/icongroupinterna**

- **Cellular Microbiology : Bacteria-Host Interactions in Health and Disease** by Brian Henderson, et al; Hardcover - 478 pages (May 28, 1999), John Wiley & Sons; ISBN: 047198678X; **http://www.amazon.com/exec/obidos/ASIN/047198678X/icongroupinterna**
- **The Comprehensive Sourcebook of Bacterial Protein Toxins** by Joseph E. Alouf (Editor), John H. Freer (Editor); Hardcover - 718 pages, 2nd edition (August 15, 1999), Academic Press; ISBN: 0120530759; **http://www.amazon.com/exec/obidos/ASIN/0120530759/icongroupinterna**
- **Current Diagnosis & Treatment in Infectious Diseases** by Walter R. Wilson (Editor), et al; Paperback - 985 pages, 1st edition (June 22, 2001), McGraw-Hill Professional Publishing; ISBN: 0838514944; **http://www.amazon.com/exec/obidos/ASIN/0838514944/icongroupinterna**
- **Hunter's Tropical Medicine and Emerging Infectious Diseases** by George W. Hunter (Editor), et al; Hardcover - 1192 pages, 8th edition (January 15, 2000), W B Saunders Co; ISBN: 0721662234; **http://www.amazon.com/exec/obidos/ASIN/0721662234/icongroupinterna**
- **Infectious Disease** by Barbara Bannister, et al; Paperback - 506 pages, 2nd edition (August 15, 2000), Blackwell Science Inc.; ISBN: 0632053194; **http://www.amazon.com/exec/obidos/ASIN/0632053194/icongroupinterna**
- **Infectious Disease Epidemiology: Theory and Practice** by Kenrad E. Nelson, et al; Hardcover - 600 pages (May 2000), Aspen Publishers, Inc.; ISBN: 083421766X; **http://www.amazon.com/exec/obidos/ASIN/083421766X/icongroupinterna**
- **Laboratory Diagnosis of Bacterial Infections (Infectious Disease and Therapy, Vol 26)** by Nevio Cimolai (Editor); Hardcover (August 2001), Marcel Dekker; ISBN: 0824705890; **http://www.amazon.com/exec/obidos/ASIN/0824705890/icongroupinterna**
- **Mandell, Douglas, and Bennett's Principles & Practice of Infectious Diseases (2 Vol. Set)** by Gerald L. Mandell (Editor), et al; Hardcover - 3263 pages, 5th edition (June 15, 2000), Churchill Livingstone; ISBN: 044307593X; **http://www.amazon.com/exec/obidos/ASIN/044307593X/icongroupinterna**
- **Molecular Bacteriology: Protocols and Clinical Applications** by Neil Woodford (Editor), Alan Johnson (Editor); Hardcover - 682 pages, 1st edition (June 15, 1998), Humana Press; ISBN: 0896034984; **http://www.amazon.com/exec/obidos/ASIN/0896034984/icongroupinterna**
- **Molecular Epidemiology of Infectious Diseases** by R. C. Andrew Thompson; Hardcover - 326 pages, 1st edition (October 15, 2000), Edward

Arnold; ISBN: 0340759097;
http://www.amazon.com/exec/obidos/ASIN/0340759097/icongroupinterna

- **Persistent Bacterial Infections** by James P. Nataro (Editor), et al; Hardcover (June 2000), American Society for Microbiology; ISBN: 1555811590;
http://www.amazon.com/exec/obidos/ASIN/1555811590/icongroupinterna

PART III. APPENDICES

ABOUT PART III

Part III is a collection of appendices on general medical topics which may be of interest to patients with Vibrio vulnificus infection and related conditions.

APPENDIX A. RESEARCHING YOUR MEDICATIONS

Overview

There are a number of sources available on new or existing medications which could be prescribed to patients with Vibrio vulnificus infection. While a number of hard copy or CD-Rom resources are available to patients and physicians for research purposes, a more flexible method is to use Internet-based databases. In this chapter, we will begin with a general overview of medications. We will then proceed to outline official recommendations on how you should view your medications. You may also want to research medications that you are currently taking for other conditions as they may interact with medications for Vibrio vulnificus infection. Research can give you information on the side effects, interactions, and limitations of prescription drugs used in the treatment of Vibrio vulnificus infection. Broadly speaking, there are two sources of information on approved medications: public sources and private sources. We will emphasize free-to-use public sources.

Your Medications: The Basics[35]

The Agency for Health Care Research and Quality has published extremely useful guidelines on how you can best participate in the medication aspects of Vibrio vulnificus infection. Taking medicines is not always as simple as swallowing a pill. It can involve many steps and decisions each day. The AHCRQ recommends that patients with Vibrio vulnificus infection take part in treatment decisions. Do not be afraid to ask questions and talk about your concerns. By taking a moment to ask questions early, you may avoid problems later. Here are some points to cover each time a new medicine is prescribed**:**

- Ask about all parts of your treatment, including diet changes, exercise, and medicines.
- Ask about the risks and benefits of each medicine or other treatment you might receive.
- Ask how often you or your doctor will check for side effects from a given medication.

Do not hesitate to ask what is important to you about your medicines. You may want a medicine with the fewest side effects, or the fewest doses to take each day. You may care most about cost, or how the medicine might affect how you live or work. Or, you may want the medicine your doctor believes will work the best. Telling your doctor will help him or her select the best treatment for you.

Do not be afraid to "bother" your doctor with your concerns and questions about medications for Vibrio vulnificus infection. You can also talk to a nurse or a pharmacist. They can help you better understand your treatment plan. Feel free to bring a friend or family member with you when you visit your doctor. Talking over your options with someone you trust can help you make better choices, especially if you are not feeling well. Specifically, ask your doctor the following:

- The name of the medicine and what it is supposed to do.
- How and when to take the medicine, how much to take, and for how long.
- What food, drinks, other medicines, or activities you should avoid while taking the medicine.
- What side effects the medicine may have, and what to do if they occur.

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[35] This section is adapted from AHCRQ: **http://www.ahcpr.gov/consumer/ncpiebro.htm**.

- If you can get a refill, and how often.
- About any terms or directions you do not understand.
- What to do if you miss a dose.
- If there is written information you can take home (most pharmacies have information sheets on your prescription medicines; some even offer large-print or Spanish versions).

Do not forget to tell your doctor about all the medicines you are currently taking (not just those for Vibrio vulnificus infection). This includes prescription medicines and the medicines that you buy over the counter. Then your doctor can avoid giving you a new medicine that may not work well with the medications you take now. When talking to your doctor, you may wish to prepare a list of medicines you currently take, the reason you take them, and how you take them. Be sure to include the following information for each:

- Name of medicine
- Reason taken
- Dosage
- Time(s) of day

Also include any over-the-counter medicines, such as:

- Laxatives
- Diet pills
- Vitamins
- Cold medicine
- Aspirin or other pain, headache, or fever medicine
- Cough medicine
- Allergy relief medicine
- Antacids
- Sleeping pills
- Others (include names)

Learning More about Your Medications

Because of historical investments by various organizations and the emergence of the Internet, it has become rather simple to learn about the medications your doctor has recommended for Vibrio vulnificus infection. One such source is the United States Pharmacopeia. In 1820, eleven physicians met in Washington, D.C. to establish the first compendium of standard drugs for the United States. They called this compendium the "U.S. Pharmacopeia (USP)." Today, the USP is a non-profit organization consisting of 800 volunteer scientists, eleven elected officials, and 400 representatives of state associations and colleges of medicine and pharmacy. The USP is located in Rockville, Maryland, and its home page is located at **www.usp.org**. The USP currently provides standards for over 3,700 medications. The resulting USP DI® Advice for the Patient® can be accessed through the National Library of Medicine of the National Institutes of Health. The database is partially derived from lists of federally approved medications in the Food and Drug Administration's (FDA) Drug Approvals database.[36]

While the FDA database is rather large and difficult to navigate, the Phamacopeia is both user-friendly and free to use. It covers more than 9,000 prescription and over-the-counter medications. To access this database, simply type the following hyperlink into your Web browser: **http://www.nlm.nih.gov/medlineplus/druginformation.html**. To view examples of a given medication (brand names, category, description, preparation, proper use, precautions, side effects, etc.), simply follow the hyperlinks indicated within the United States Pharmacopoeia (USP). It is important to read the disclaimer by the USP (**http://www.nlm.nih.gov/medlineplus/drugdisclaimer.html**) before using the information provided.

Commercial Databases

In addition to the medications listed in the USP above, a number of commercial sites are available by subscription to physicians and their institutions. You may be able to access these sources from your local medical library or your doctor's office.

[36] Though cumbersome, the FDA database can be freely browsed at the following site: **www.fda.gov/cder/da/da.htm**.

Reuters Health Drug Database

The Reuters Health Drug Database can be searched by keyword at the hyperlink: **http://www.reutershealth.com/frame2/drug.html**.

Mosby's GenRx

Mosby's GenRx database (also available on CD-Rom and book format) covers 45,000 drug products including generics and international brands. It provides prescribing information, drug interactions, and patient information. Information can be obtained at the following hyperlink: **http://www.genrx.com/Mosby/PhyGenRx/group.html**.

Physicians Desk Reference

The Physicians Desk Reference database (also available in CD-Rom and book format) is a full-text drug database. The database is searchable by brand name, generic name or by indication. It features multiple drug interactions reports. Information can be obtained at the following hyperlink: **http://physician.pdr.net/physician/templates/en/acl/psuser_t.htm**.

Other Web Sites

A number of additional Web sites discuss drug information. As an example, you may like to look at **www.drugs.com** which reproduces the information in the Pharmacopeia as well as commercial information. You may also want to consider the Web site of the Medical Letter, Inc. which allows users to download articles on various drugs and therapeutics for a nominal fee: **http://www.medletter.com/**.

Contraindications and Interactions (Hidden Dangers)

Some of the medications mentioned in the previous discussions can be problematic for patients with Vibrio vulnificus infection--not because they are used in the treatment process, but because of contraindications, or side effects. Medications with contraindications are those that could react with drugs used to treat Vibrio vulnificus infection or potentially create deleterious side effects in patients with Vibrio vulnificus infection. You should ask your physician about any contraindications, especially as these

might apply to other medications that you may be taking for common ailments.

Drug-drug interactions occur when two or more drugs react with each other. This drug-drug interaction may cause you to experience an unexpected side effect. Drug interactions may make your medications less effective, cause unexpected side effects, or increase the action of a particular drug. Some drug interactions can even be harmful to you.

Be sure to read the label every time you use a nonprescription or prescription drug, and take the time to learn about drug interactions. These precautions may be critical to your health. You can reduce the risk of potentially harmful drug interactions and side effects with a little bit of knowledge and common sense.

Drug labels contain important information about ingredients, uses, warnings, and directions which you should take the time to read and understand. Labels also include warnings about possible drug interactions. Further, drug labels may change as new information becomes available. This is why it's especially important to read the label every time you use a medication. When your doctor prescribes a new drug, discuss all over-the-counter and prescription medications, dietary supplements, vitamins, botanicals, minerals and herbals you take as well as the foods you eat. Ask your pharmacist for the package insert for each prescription drug you take. The package insert provides more information about potential drug interactions.

A Final Warning

At some point, you may hear of alternative medications from friends, relatives, or in the news media. Advertisements may suggest that certain alternative drugs can produce positive results for patients with Vibrio vulnificus infection. Exercise caution--some of these drugs may have fraudulent claims, and others may actually hurt you. The Food and Drug Administration (FDA) is the official U.S. agency charged with discovering which medications are likely to improve the health of patients with Vibrio vulnificus infection. The FDA warns patients to watch out for[37]:

- Secret formulas (real scientists share what they know)

[37] This section has been adapted from **http://www.fda.gov/opacom/lowlit/medfraud.html**.

- Amazing breakthroughs or miracle cures (real breakthroughs don't happen very often; when they do, real scientists do not call them amazing or miracles)
- Quick, painless, or guaranteed cures
- If it sounds too good to be true, it probably isn't true.

If you have any questions about any kind of medical treatment, the FDA may have an office near you. Look for their number in the blue pages of the phone book. You can also contact the FDA through its toll-free number, 1-888-INFO-FDA (1-888-463-6332), or on the World Wide Web at **www.fda.gov**.

General References

In addition to the resources provided earlier in this chapter, the following general references describe medications (sorted alphabetically by title; hyperlinks provide rankings, information and reviews at Amazon.com):

- **Drug Interactions in Infectious Diseases (Infectious Disease)** by Stephen C. Piscitelli (Editor), et al; Hardcover - 372 pages (September 2000), Humana Press; ISBN: 0896037509; **http://www.amazon.com/exec/obidos/ASIN/0896037509/icongroupinterna**
- **Management of Antimicrobials in Infectious Diseases: Impact of Antibiotic Resistance** by Arch G. Mainous, Ph.D. (Editor), et al; Hardcover - 350 pages, 1st edition (January 15, 2001), Humana Press; ISBN: 0896038211; **http://www.amazon.com/exec/obidos/ASIN/0896038211/icongroupinterna**
- **Manual of Antibiotics and Infectious Diseases: Treatment and Prevention** by John E. Conte; Paperback - 755 pages, 9th edition (December 15, 2001), Lippincott, Williams & Wilkins Publishers; ISBN: 0781723167; **http://www.amazon.com/exec/obidos/ASIN/0781723167/icongroupinterna**

APPENDIX B. RESEARCHING ALTERNATIVE MEDICINE

Overview

Complementary and alternative medicine (CAM) is one of the most contentious aspects of modern medical practice. You may have heard of these treatments on the radio or on television. Maybe you have seen articles written about these treatments in magazines, newspapers, or books. Perhaps your friends or doctor have mentioned alternatives.

In this chapter, we will begin by giving you a broad perspective on complementary and alternative therapies. Next, we will introduce you to official information sources on CAM relating to Vibrio vulnificus infection. Finally, at the conclusion of this chapter, we will provide a list of readings on Vibrio vulnificus infection from various authors. We will begin, however, with the National Center for Complementary and Alternative Medicine's (NCCAM) overview of complementary and alternative medicine.

What Is CAM?[38]

Complementary and alternative medicine (CAM) covers a broad range of healing philosophies, approaches, and therapies. Generally, it is defined as those treatments and healthcare practices which are not taught in medical schools, used in hospitals, or reimbursed by medical insurance companies. Many CAM therapies are termed "holistic," which generally means that the healthcare practitioner considers the whole person, including physical, mental, emotional, and spiritual health. Some of these therapies are also known as "preventive," which means that the practitioner educates and

[38] Adapted from the NCCAM: **http://nccam.nih.gov/nccam/fcp/faq/index.html#what-is**.

treats the person to prevent health problems from arising, rather than treating symptoms after problems have occurred.

People use CAM treatments and therapies in a variety of ways. Therapies are used alone (often referred to as alternative), in combination with other alternative therapies, or in addition to conventional treatment (sometimes referred to as complementary). Complementary and alternative medicine, or "integrative medicine," includes a broad range of healing philosophies, approaches, and therapies. Some approaches are consistent with physiological principles of Western medicine, while others constitute healing systems with non-Western origins. While some therapies are far outside the realm of accepted Western medical theory and practice, others are becoming established in mainstream medicine.

Complementary and alternative therapies are used in an effort to prevent illness, reduce stress, prevent or reduce side effects and symptoms, or control or cure disease. Some commonly used methods of complementary or alternative therapy include mind/body control interventions such as visualization and relaxation, manual healing including acupressure and massage, homeopathy, vitamins or herbal products, and acupuncture.

What Are the Domains of Alternative Medicine?[39]

The list of CAM practices changes continually. The reason being is that these new practices and therapies are often proved to be safe and effective, and therefore become generally accepted as "mainstream" healthcare practices. Today, CAM practices may be grouped within five major domains: (1) alternative medical systems, (2) mind-body interventions, (3) biologically-based treatments, (4) manipulative and body-based methods, and (5) energy therapies. The individual systems and treatments comprising these categories are too numerous to list in this sourcebook. Thus, only limited examples are provided within each.

Alternative Medical Systems

Alternative medical systems involve complete systems of theory and practice that have evolved independent of, and often prior to, conventional biomedical approaches. Many are traditional systems of medicine that are

[39] Adapted from the NCCAM: **http://nccam.nih.gov/nccam/fcp/classify/index.html**.

practiced by individual cultures throughout the world, including a number of venerable Asian approaches.

Traditional oriental medicine emphasizes the balance or disturbances of qi (pronounced chi) or vital energy in health and disease, respectively. Traditional oriental medicine consists of a group of techniques and methods including acupuncture, herbal medicine, oriental massage, and qi gong (a form of energy therapy). Acupuncture involves stimulating specific anatomic points in the body for therapeutic purposes, usually by puncturing the skin with a thin needle.

Ayurveda is India's traditional system of medicine. Ayurvedic medicine (meaning "science of life") is a comprehensive system of medicine that places equal emphasis on body, mind, and spirit. Ayurveda strives to restore the innate harmony of the individual. Some of the primary Ayurvedic treatments include diet, exercise, meditation, herbs, massage, exposure to sunlight, and controlled breathing.

Other traditional healing systems have been developed by the world's indigenous populations. These populations include Native American, Aboriginal, African, Middle Eastern, Tibetan, and Central and South American cultures. Homeopathy and naturopathy are also examples of complete alternative medicine systems.

Homeopathic medicine is an unconventional Western system that is based on the principle that "like cures like," i.e., that the same substance that in large doses produces the symptoms of an illness, in very minute doses cures it. Homeopathic health practitioners believe that the more dilute the remedy, the greater its potency. Therefore, they use small doses of specially prepared plant extracts and minerals to stimulate the body's defense mechanisms and healing processes in order to treat illness.

Naturopathic medicine is based on the theory that disease is a manifestation of alterations in the processes by which the body naturally heals itself and emphasizes health restoration rather than disease treatment. Naturopathic physicians employ an array of healing practices, including the following: diet and clinical nutrition, homeopathy, acupuncture, herbal medicine, hydrotherapy (the use of water in a range of temperatures and methods of applications), spinal and soft-tissue manipulation, physical therapies (such as those involving electrical currents, ultrasound, and light), therapeutic counseling, and pharmacology.

Mind-Body Interventions

Mind-body interventions employ a variety of techniques designed to facilitate the mind's capacity to affect bodily function and symptoms. Only a select group of mind-body interventions having well-documented theoretical foundations are considered CAM. For example, patient education and cognitive-behavioral approaches are now considered "mainstream." On the other hand, complementary and alternative medicine includes meditation, certain uses of hypnosis, dance, music, and art therapy, as well as prayer and mental healing.

Biological-Based Therapies

This category of CAM includes natural and biological-based practices, interventions, and products, many of which overlap with conventional medicine's use of dietary supplements. This category includes herbal, special dietary, orthomolecular, and individual biological therapies.

Herbal therapy employs an individual herb or a mixture of herbs for healing purposes. An herb is a plant or plant part that produces and contains chemical substances that act upon the body. Special diet therapies, such as those proposed by Drs. Atkins, Ornish, Pritikin, and Weil, are believed to prevent and/or control illness as well as promote health. Orthomolecular therapies aim to treat disease with varying concentrations of chemicals such as magnesium, melatonin, and mega-doses of vitamins. Biological therapies include, for example, the use of laetrile and shark cartilage to treat cancer and the use of bee pollen to treat autoimmune and inflammatory diseases.

Manipulative and Body-Based Methods

This category includes methods that are based on manipulation and/or movement of the body. For example, chiropractors focus on the relationship between structure and function, primarily pertaining to the spine, and how that relationship affects the preservation and restoration of health. Chiropractors use manipulative therapy as an integral treatment tool.

In contrast, osteopaths place particular emphasis on the musculoskeletal system and practice osteopathic manipulation. Osteopaths believe that all of the body's systems work together and that disturbances in one system may have an impact upon function elsewhere in the body. Massage therapists manipulate the soft tissues of the body to normalize those tissues.

Energy Therapies

Energy therapies focus on energy fields originating within the body (biofields) or those from other sources (electromagnetic fields). Biofield therapies are intended to affect energy fields (the existence of which is not yet experimentally proven) that surround and penetrate the human body. Some forms of energy therapy manipulate biofields by applying pressure and/or manipulating the body by placing the hands in or through these fields. Examples include Qi gong, Reiki and Therapeutic Touch.

Qi gong is a component of traditional oriental medicine that combines movement, meditation, and regulation of breathing to enhance the flow of vital energy (qi) in the body, improve blood circulation, and enhance immune function. Reiki, the Japanese word representing Universal Life Energy, is based on the belief that, by channeling spiritual energy through the practitioner, the spirit is healed and, in turn, heals the physical body. Therapeutic Touch is derived from the ancient technique of "laying-on of hands." It is based on the premises that the therapist's healing force affects the patient's recovery and that healing is promoted when the body's energies are in balance. By passing their hands over the patient, these healers identify energy imbalances.

Bioelectromagnetic-based therapies involve the unconventional use of electromagnetic fields to treat illnesses or manage pain. These therapies are often used to treat asthma, cancer, and migraine headaches. Types of electromagnetic fields which are manipulated in these therapies include pulsed fields, magnetic fields, and alternating current or direct current fields.

Can Alternatives Affect My Treatment?

A critical issue in pursuing complementary alternatives mentioned thus far is the risk that these might have undesirable interactions with your medical treatment. It becomes all the more important to speak with your doctor who can offer advice on the use of alternatives. Official sources confirm this view. Though written for women, we find that the National Women's Health Information Center's advice on pursuing alternative medicine is appropriate for patients of both genders and all ages.[40]

[40] Adapted from **http://www.4woman.gov/faq/alternative.htm**.

Is It Okay to Want Both Traditional and Alternative Medicine?

Should you wish to explore non-traditional types of treatment, be sure to discuss all issues concerning treatments and therapies with your healthcare provider, whether a physician or practitioner of complementary and alternative medicine. Competent healthcare management requires knowledge of both conventional and alternative therapies you are taking for the practitioner to have a complete picture of your treatment plan.

The decision to use complementary and alternative treatments is an important one. Consider before selecting an alternative therapy, the safety and effectiveness of the therapy or treatment, the expertise and qualifications of the healthcare practitioner, and the quality of delivery. These topics should be considered when selecting any practitioner or therapy.

Finding CAM References on Vibrio Vulnificus Infection

Having read the previous discussion, you may be wondering which complementary or alternative treatments might be appropriate for Vibrio vulnificus infection. For the remainder of this chapter, we will direct you to a number of official sources which can assist you in researching studies and publications. Some of these articles are rather technical, so some patience may be required.

National Center for Complementary and Alternative Medicine

The National Center for Complementary and Alternative Medicine (NCCAM) of the National Institutes of Health (**http://nccam.nih.gov**) has created a link to the National Library of Medicine's databases to allow patients to search for articles that specifically relate to Vibrio vulnificus infection and complementary medicine. To search the database, go to the following Web site: **www.nlm.nih.gov/nccam/camonpubmed.html**. Select "CAM on PubMed." Enter "Vibrio vulnificus infection" (or synonyms) into the search box. Click "Go." The following references provide information on particular aspects of complementary and alternative medicine (CAM) that are related to Vibrio vulnificus infection:

- **Collagenolytic activity of Vibrio vulnificus: potential contribution to its invasiveness.**
  Author(s): Smith GC, Merkel JR.

Source: Infection and Immunity. 1982 March; 35(3): 1155-6.
http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=6279515&dopt=Abstract

- **Direct identification of Vibrio vulnificus in clinical specimens by nested PCR.**
  Author(s): Lee SE, Kim SY, Kim SJ, Kim HS, Shin JH, Choi SH, Chung SS, Rhee JH.
  Source: Journal of Clinical Microbiology. 1998 October; 36(10): 2887-92.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9738039&dopt=Abstract

- **Evaluation of a simplified semi-quantitative protocol for the estimation of Vibrio vulnificus in bathing water using cellobiose-colistin agar: a collaborative study with 13 municipal food controlling units in Denmark.**
  Author(s): Hoi L, Dalsgaard A.
  Source: Journal of Microbiological Methods. 2000 June; 41(1): 53-7.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=10856777&dopt=Abstract

- **Low incidence of Vibrio vulnificus among Vibrio isolates from sea water and shellfish of the western Mediterranean coast.**
  Author(s): Arias CR, Macian MC, Aznar R, Garay E, Pujalte MJ.
  Source: Journal of Applied Microbiology. 1999 January; 86(1): 125-34.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=10030016&dopt=Abstract

- **Purification and characterization of a secreted protease from the pathogenic marine bacterium Vibrio anguillarum.**
  Author(s): Farrell DH, Crosa JH.
  Source: Biochemistry. 1991 April 9; 30(14): 3432-6.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=2012804&dopt=Abstract

- **Rapid serological identification of Vibrio vulnificus by anti-H coagglutination.**
  Author(s): Simonson J, Siebeling RJ.

Source: Applied and Environmental Microbiology. 1986 December; 52(6): 1299-304.
http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3789720&dopt=Abstract

- **Regulation of proteolytic activity of Vibrio vulnificus by iron-containing compounds.**
  Author(s): Simpson LM, Oliver JD.
  Source: Microbial Pathogenesis. 1993 March; 14(3): 249-52.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8321126&dopt=Abstract

Additional Web Resources

A number of additional Web sites offer encyclopedic information covering CAM and related topics. The following is a representative sample:

- Alternative Medicine Foundation, Inc.: **http://www.herbmed.org/**
- AOL: **http://search.aol.com/cat.adp?id=169&layer=&from=subcats**
- Chinese Medicine: **http://www.newcenturynutrition.com/**
- drkoop.com®: **http://www.drkoop.com/InteractiveMedicine/IndexC.html**
- Family Village: **http://www.familyvillage.wisc.edu/med_altn.htm**
- Google: **http://directory.google.com/Top/Health/Alternative/**
- Healthnotes: **http://www.thedacare.org/healthnotes/**
- Open Directory Project: **http://dmoz.org/Health/Alternative/**
- TPN.com: **http://www.tnp.com/**
- Yahoo.com: **http://dir.yahoo.com/Health/Alternative_Medicine/**
- WebMD®Health: **http://my.webmd.com/drugs_and_herbs**
- WellNet: **http://www.wellnet.ca/herbsa-c.htm**
- WholeHealthMD.com: **http://www.wholehealthmd.com/reflib/0,1529,,00.html**

General References

A good place to find general background information on CAM is the National Library of Medicine. It has prepared within the MEDLINEplus system an information topic page dedicated to complementary and alternative medicine. To access this page, go to the MEDLINEplus site at: **www.nlm.nih.gov/medlineplus/alternativemedicine.html.** This Web site provides a general overview of various topics and can lead to a number of general sources. The following additional references describe, in broad terms, alternative and complementary medicine (sorted alphabetically by title; hyperlinks provide rankings, information, and reviews at Amazon.com):

- **Herbal Antibiotics : Natural Alternatives for Treating Drug-Resistant Bacteria (Storey Medicinal Herb Guide)** by Stephen Harrod Buhner; Paperback - 128 pages (September 1999), Storey Books; ISBN: 1580171486; **http://www.amazon.com/exec/obidos/ASIN/1580171486/icongroupinterna**
- **Natural Alternatives to Antibiotics** by John McKenna; Paperback - 176 pages (November 1998), Avery Penguin Putnam; ISBN: 0895298392; **http://www.amazon.com/exec/obidos/ASIN/0895298392/icongroupinterna**
- **Alternative Medicine for Dummies** by James Dillard (Author); Audio Cassette, Abridged edition (1998), Harper Audio; ISBN: 0694520659; **http://www.amazon.com/exec/obidos/ASIN/0694520659/icongroupinterna**
- **Complementary and Alternative Medicine Secrets** by W. Kohatsu (Editor); Hardcover (2001), Hanley & Belfus; ISBN: 1560534400; **http://www.amazon.com/exec/obidos/ASIN/1560534400/icongroupinterna**
- **Dictionary of Alternative Medicine** by J. C. Segen; Paperback-2nd edition (2001), Appleton & Lange; ISBN: 0838516211; **http://www.amazon.com/exec/obidos/ASIN/0838516211/icongroupinterna**
- **Eat, Drink, and Be Healthy: The Harvard Medical School Guide to Healthy Eating** by Walter C. Willett, MD, et al; Hardcover - 352 pages (2001), Simon & Schuster; ISBN: 0684863375; **http://www.amazon.com/exec/obidos/ASIN/0684863375/icongroupinterna**
- **Encyclopedia of Natural Medicine, Revised 2nd Edition** by Michael T. Murray, Joseph E. Pizzorno; Paperback - 960 pages, 2nd Rev edition (1997), Prima Publishing; ISBN: 0761511571; **http://www.amazon.com/exec/obidos/ASIN/0761511571/icongroupinterna**
- **Integrative Medicine: An Introduction to the Art & Science of Healing** by Andrew Weil (Author); Audio Cassette, Unabridged edition (2001), Sounds True; ISBN: 1564558541; **http://www.amazon.com/exec/obidos/ASIN/1564558541/icongroupinterna**

- **New Encyclopedia of Herbs & Their Uses** by Deni Bown; Hardcover - 448 pages, Revised edition (2001), DK Publishing; ISBN: 078948031X; **http://www.amazon.com/exec/obidos/ASIN/078948031X/icongroupinterna**
- **Textbook of Complementary and Alternative Medicine** by Wayne B. Jonas; Hardcover (2003), Lippincott, Williams & Wilkins; ISBN: 0683044370; **http://www.amazon.com/exec/obidos/ASIN/0683044370/icongroupinterna**

For additional information on complementary and alternative medicine, ask your doctor or write to:

National Institutes of Health
National Center for Complementary and Alternative Medicine Clearinghouse
P. O. Box 8218
Silver Spring, MD 20907-8218

Vocabulary Builder

Aeromonas: A genus of gram-negative, facultatively anaerobic, rod-shaped bacteria that occurs singly, in pairs, or in short chains. Its organisms are found in fresh water and sewage and are pathogenic to humans, frogs, and fish. [NIH]

APPENDIX C. RESEARCHING NUTRITION

Overview

Since the time of Hippocrates, doctors have understood the importance of diet and nutrition to patients' health and well-being. Since then, they have accumulated an impressive archive of studies and knowledge dedicated to this subject. Based on their experience, doctors and healthcare providers may recommend particular dietary supplements to patients with Vibrio vulnificus infection. Any dietary recommendation is based on a patient's age, body mass, gender, lifestyle, eating habits, food preferences, and health condition. It is therefore likely that different patients with Vibrio vulnificus infection may be given different recommendations. Some recommendations may be directly related to Vibrio vulnificus infection, while others may be more related to the patient's general health. These recommendations, themselves, may differ from what official sources recommend for the average person.

In this chapter we will begin by briefly reviewing the essentials of diet and nutrition that will broadly frame more detailed discussions of Vibrio vulnificus infection. We will then show you how to find studies dedicated specifically to nutrition and Vibrio vulnificus infection.

Food and Nutrition: General Principles

What Are Essential Foods?

Food is generally viewed by official sources as consisting of six basic elements: (1) fluids, (2) carbohydrates, (3) protein, (4) fats, (5) vitamins, and

(6) minerals. Consuming a combination of these elements is considered to be a healthy diet:

- **Fluids** are essential to human life as 80-percent of the body is composed of water. Water is lost via urination, sweating, diarrhea, vomiting, diuretics (drugs that increase urination), caffeine, and physical exertion.
- **Carbohydrates** are the main source for human energy (thermoregulation) and the bulk of typical diets. They are mostly classified as being either simple or complex. Simple carbohydrates include sugars which are often consumed in the form of cookies, candies, or cakes. Complex carbohydrates consist of starches and dietary fibers. Starches are consumed in the form of pastas, breads, potatoes, rice, and other foods. Soluble fibers can be eaten in the form of certain vegetables, fruits, oats, and legumes. Insoluble fibers include brown rice, whole grains, certain fruits, wheat bran and legumes.
- **Proteins** are eaten to build and repair human tissues. Some foods that are high in protein are also high in fat and calories. Food sources for protein include nuts, meat, fish, cheese, and other dairy products.
- **Fats** are consumed for both energy and the absorption of certain vitamins. There are many types of fats, with many general publications recommending the intake of unsaturated fats or those low in cholesterol.

Vitamins and minerals are fundamental to human health, growth, and, in some cases, disease prevention. Most are consumed in your diet (exceptions being vitamins K and D which are produced by intestinal bacteria and sunlight on the skin, respectively). Each vitamin and mineral plays a different role in health. The following outlines essential vitamins:

- **Vitamin A** is important to the health of your eyes, hair, bones, and skin; sources of vitamin A include foods such as eggs, carrots, and cantaloupe.
- **Vitamin B^1**, also known as thiamine, is important for your nervous system and energy production; food sources for thiamine include meat, peas, fortified cereals, bread, and whole grains.
- **Vitamin B^2**, also known as riboflavin, is important for your nervous system and muscles, but is also involved in the release of proteins from nutrients; food sources for riboflavin include dairy products, leafy vegetables, meat, and eggs.
- **Vitamin B^3**, also known as niacin, is important for healthy skin and helps the body use energy; food sources for niacin include peas, peanuts, fish, and whole grains

- **Vitamin B^6**, also known as pyridoxine, is important for the regulation of cells in the nervous system and is vital for blood formation; food sources for pyridoxine include bananas, whole grains, meat, and fish.
- **Vitamin B^{12}** is vital for a healthy nervous system and for the growth of red blood cells in bone marrow; food sources for vitamin B^{12} include yeast, milk, fish, eggs, and meat.
- **Vitamin C** allows the body's immune system to fight various diseases, strengthens body tissue, and improves the body's use of iron; food sources for vitamin C include a wide variety of fruits and vegetables.
- **Vitamin D** helps the body absorb calcium which strengthens bones and teeth; food sources for vitamin D include oily fish and dairy products.
- **Vitamin E** can help protect certain organs and tissues from various degenerative diseases; food sources for vitamin E include margarine, vegetables, eggs, and fish.
- **Vitamin K** is essential for bone formation and blood clotting; common food sources for vitamin K include leafy green vegetables.
- **Folic Acid** maintains healthy cells and blood and, when taken by a pregnant woman, can prevent her fetus from developing neural tube defects; food sources for folic acid include nuts, fortified breads, leafy green vegetables, and whole grains.

It should be noted that one can overdose on certain vitamins which become toxic if consumed in excess (e.g. vitamin A, D, E and K).

Like vitamins, minerals are chemicals that are required by the body to remain in good health. Because the human body does not manufacture these chemicals internally, we obtain them from food and other dietary sources. The more important minerals include:

- **Calcium** is needed for healthy bones, teeth, and muscles, but also helps the nervous system function; food sources for calcium include dry beans, peas, eggs, and dairy products.
- **Chromium** is helpful in regulating sugar levels in blood; food sources for chromium include egg yolks, raw sugar, cheese, nuts, beets, whole grains, and meat.
- **Fluoride** is used by the body to help prevent tooth decay and to reinforce bone strength; sources of fluoride include drinking water and certain brands of toothpaste.

- **Iodine** helps regulate the body's use of energy by synthesizing into the hormone thyroxine; food sources include leafy green vegetables, nuts, egg yolks, and red meat.
- **Iron** helps maintain muscles and the formation of red blood cells and certain proteins; food sources for iron include meat, dairy products, eggs, and leafy green vegetables.
- **Magnesium** is important for the production of DNA, as well as for healthy teeth, bones, muscles, and nerves; food sources for magnesium include dried fruit, dark green vegetables, nuts, and seafood.
- **Phosphorous** is used by the body to work with calcium to form bones and teeth; food sources for phosphorous include eggs, meat, cereals, and dairy products.
- **Selenium** primarily helps maintain normal heart and liver functions; food sources for selenium include wholegrain cereals, fish, meat, and dairy products.
- **Zinc** helps wounds heal, the formation of sperm, and encourage rapid growth and energy; food sources include dried beans, shellfish, eggs, and nuts.

The United States government periodically publishes recommended diets and consumption levels of the various elements of food. Again, your doctor may encourage deviations from the average official recommendation based on your specific condition. To learn more about basic dietary guidelines, visit the Web site: **http://www.health.gov/dietaryguidelines/**. Based on these guidelines, many foods are required to list the nutrition levels on the food's packaging. Labeling Requirements are listed at the following site maintained by the Food and Drug Administration: **http://www.cfsan.fda.gov/~dms/lab-cons.html**. When interpreting these requirements, the government recommends that consumers become familiar with the following abbreviations before reading FDA literature:[41]

- **DVs (Daily Values):** A new dietary reference term that will appear on the food label. It is made up of two sets of references, DRVs and RDIs.
- **DRVs (Daily Reference Values):** A set of dietary references that applies to fat, saturated fat, cholesterol, carbohydrate, protein, fiber, sodium, and potassium.
- **RDIs (Reference Daily Intakes):** A set of dietary references based on the Recommended Dietary Allowances for essential vitamins and minerals

[41] Adapted from the FDA: **http://www.fda.gov/fdac/special/foodlabel/dvs.html**.

and, in selected groups, protein. The name "RDI" replaces the term "U.S. RDA."

- **RDAs (Recommended Dietary Allowances):** A set of estimated nutrient allowances established by the National Academy of Sciences. It is updated periodically to reflect current scientific knowledge.

What Are Dietary Supplements?[42]

Dietary supplements are widely available through many commercial sources, including health food stores, grocery stores, pharmacies, and by mail. Dietary supplements are provided in many forms including tablets, capsules, powders, gel-tabs, extracts, and liquids. Historically in the United States, the most prevalent type of dietary supplement was a multivitamin/mineral tablet or capsule that was available in pharmacies, either by prescription or "over the counter." Supplements containing strictly herbal preparations were less widely available. Currently in the United States, a wide array of supplement products are available, including vitamin, mineral, other nutrients, and botanical supplements as well as ingredients and extracts of animal and plant origin.

The Office of Dietary Supplements (ODS) of the National Institutes of Health is the official agency of the United States which has the expressed goal of acquiring "new knowledge to help prevent, detect, diagnose, and treat disease and disability, from the rarest genetic disorder to the common cold."[43] According to the ODS, dietary supplements can have an important impact on the prevention and management of disease and on the maintenance of health.[44] The ODS notes that considerable research on the effects of dietary supplements has been conducted in Asia and Europe where the use of plant products, in particular, has a long tradition. However, the overwhelming majority of supplements have not been studied scientifically.

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[42] This discussion has been adapted from the NIH: **http://ods.od.nih.gov/whatare/whatare.html**.

[43] Contact: The Office of Dietary Supplements, National Institutes of Health, Building 31, Room 1B29, 31 Center Drive, MSC 2086, Bethesda, Maryland 20892-2086, Tel: (301) 435-2920, Fax: (301) 480-1845, E-mail: **ods@nih.gov**.

[44] Adapted from **http://ods.od.nih.gov/about/about.html**. The Dietary Supplement Health and Education Act defines dietary supplements as "a product (other than tobacco) intended to supplement the diet that bears or contains one or more of the following dietary ingredients: a vitamin, mineral, amino acid, herb or other botanical; or a dietary substance for use to supplement the diet by increasing the total dietary intake; or a concentrate, metabolite, constituent, extract, or combination of any ingredient described above; and intended for ingestion in the form of a capsule, powder, softgel, or gelcap, and not represented as a conventional food or as a sole item of a meal or the diet."

To explore the role of dietary supplements in the improvement of health care, the ODS plans, organizes, and supports conferences, workshops, and symposia on scientific topics related to dietary supplements. The ODS often works in conjunction with other NIH Institutes and Centers, other government agencies, professional organizations, and public advocacy groups.

To learn more about official information on dietary supplements, visit the ODS site at **http://ods.od.nih.gov/whatare/whatare.html**. Or contact:

The Office of Dietary Supplements
National Institutes of Health
Building 31, Room 1B29
31 Center Drive, MSC 2086
Bethesda, Maryland 20892-2086
Tel: (301) 435-2920
Fax: (301) 480-1845
E-mail: ods@nih.gov

Finding Studies on Vibrio Vulnificus Infection

The NIH maintains an office dedicated to patient nutrition and diet. The National Institutes of Health's Office of Dietary Supplements (ODS) offers a searchable bibliographic database called the IBIDS (International Bibliographic Information on Dietary Supplements). The IBIDS contains over 460,000 scientific citations and summaries about dietary supplements and nutrition as well as references to published international, scientific literature on dietary supplements such as vitamins, minerals, and botanicals.[45] IBIDS is available to the public free of charge through the ODS Internet page: **http://ods.od.nih.gov/databases/ibids.html**.

After entering the search area, you have three choices: (1) IBIDS Consumer Database, (2) Full IBIDS Database, or (3) Peer Reviewed Citations Only. We recommend that you start with the Consumer Database. While you may not find references for the topics that are of most interest to you, check back periodically as this database is frequently updated. More studies can be found by searching the Full IBIDS Database. Healthcare professionals and

[45] Adapted from **http://ods.od.nih.gov**. IBIDS is produced by the Office of Dietary Supplements (ODS) at the National Institutes of Health to assist the public, healthcare providers, educators, and researchers in locating credible, scientific information on dietary supplements. IBIDS was developed and will be maintained through an interagency partnership with the Food and Nutrition Information Center of the National Agricultural Library, U.S. Department of Agriculture.

researchers generally use the third option, which lists peer-reviewed citations. In all cases, we suggest that you take advantage of the "Advanced Search" option that allows you to retrieve up to 100 fully explained references in a comprehensive format. Type "Vibrio vulnificus infection" (or synonyms) into the search box. To narrow the search, you can also select the "Title" field.

The following information is typical of that found when using the "Full IBIDS Database" when searching using "Vibrio vulnificus infection" (or a synonym):

- **A comparison of strategies for the detection and recovery of Vibrio vulnificus from marine samples of the western Mediterranean coast.**
  Source: Arias, C.R. Aznar, R. Pujalte, M.J. Garay, E. Syst-appl-microbiol. Stuttgart ; New York : G. Fischer, c1983-. March 1998. volume 21 (1) page 128-134. 0723-2020
- **Antimicrobial action of some GRAS compounds against Vibrio vulnificus.**
  Author(s): Department of Biology, University of North Carolina at Charlotte 28223.
  Source: Sun, Y Oliver, J D Food-Addit-Contam. 1994 Sep-October; 11(5): 549-58 0265-203X
- **Characterization of a Vibrio vulnificus LysR homologue, HupR, which regulates expression of the haem uptake outer membrane protein, HupA.**
  Author(s): Section of Clinical Immunology, Microbiology and Virology, Salt Lake City, Utah, 84132, U.S.A.
  Source: Litwin, C M Quackenbush, J Microb-Pathog. 2001 December; 31(6): 295-307 0882-4010
- **Cloning and characterization of an outer membrane protein of Vibrio vulnificus required for heme utilization: regulation of expression and determination of the gene sequence.**
  Author(s): Section of Clinical Immunology, Microbiology and Virology, Department of Pathology, University of Utah, Salt Lake City, Utah 84132, USA. Christine_Litwin@hlthsci.med.utah.edu
  Source: Litwin, C M Byrne, B L Infect-Immun. 1998 July; 66(7): 3134-41 0019-9567
- **Effect of iron and liver injury on the pathogenesis of Vibrio vulnificus.**
  Author(s): Department of Surgery, J. Hillis Miller Health Sciences Center, University of Florida, Gainesville 32610.
  Source: Brennaman, B Soucy, D Howard, R J J-Surg-Res. 1987 December; 43(6): 527-31 0022-4804

- **Effects of GRAS compounds on natural Vibrio vulnificus populations in oysters.**
  Source: Sun, Y. Oliver, J.D. J-food-prot. Des Moines, Iowa : International Association of Milk, Food and Environmental Sanitarians. October 1994. volume 57 (10) page 921-923. 0362-028X
- **Improved isolation of Vibrio vulnificus from seawater and sediment with cellobiose-colistin agar.**
  Author(s): Department of Veterinary Microbiology, Royal Veterinary and Agricultural University, Frederiksberg C, Denmark. lise.hoei@vetmi.kvl.dk
  Source: Hoi, L Dalsgaard, I Dalsgaard, A Appl-Environ-Microbiol. 1998 May; 64(5): 1721-4 0099-2240
- **Inhibitory effect of alpha 2-macroglobulin on Vibrio vulnificus protease.**
  Author(s): Faculty of Pharmaceutical Sciences, Okayama University.
  Source: Miyoshi, S Shinoda, S J-Biochem-(Tokyo). 1989 August; 106(2): 299-303 0021-924X
- **Inhibitory mechanism of Ca2+ on the hemolysis caused by Vibrio vulnificus cytolysin.**
  Author(s): Department of Biochemistry, Chonbuk National University Medical School, Chonju, South Korea.
  Source: Park, J W Jahng, T A Rho, H W Park, B H Kim, N H Kim, H R Biochim-Biophys-Acta. 1994 August 24; 1194(1): 166-70 0006-3002
- **Release of tumor necrosis factor alpha in response to Vibrio vulnificus capsular polysaccharide in in vivo and in vitro models.**
  Source: Powell, J.L. Wright, A.C. Wasserman, S.S. Hone, D.M. Morris, J.G. Jr. Infect-immun. Washington, D.C., American Society for Microbiology. Sept 1997. volume 65 (9) page 3713-3718. 0019-9567
- **Reversal of hypotension induced by Vibrio vulnificus lipopolysaccharide in the rat by inhibition of nitric oxide synthase.**
  Author(s): Department of Biology, University of North Carolina, Charlotte 28223.
  Source: Elmore, S P Watts, J A Simpson, L M Oliver, J D Microb-Pathog. 1992 November; 13(5): 391-7 0882-4010
- **Role of catechol siderophore synthesis in Vibrio vulnificus virulence.**
  Source: Litwin, C.M. Rayback, T.W. Skinner, J. Infect-immun. Washington, D.C., American Society for Microbiology. July 1996. volume 64 (7) page 2834-2838. 0019-9567
- **Role of iron in the virulence of Vibrio vulnificus isolated from Cuddalore coastal waters (India).**
  Author(s): CAS in Marine Biology, Annamalai University, Parangipettai.

Source: Jayalakshmi, S Venugopalan, V K Indian-J-Med-Res. 1992 November; 95294-6 0971-5916

- **Structure determination of the capsular polysaccharide from Vibrio vulnificus strain 6353.**
  Author(s): Department of Chemistry and Biochemistry, University of Maryland Baltimore County, Baltimore 21250, USA.
  Source: Reddy, G P Hayat, U Xu, Q Reddy, K V Wang, Y Chiu, K W Morris, J G Bush, C A Eur-J-Biochem. 1998 July 1; 255(1): 279-88 0014-2956
- **Survival of Vibrio vulnificus at reduced temperatures and elevated nutrient.**
  Source: Oliver, J.D. Wanucha, D. J-Food-Saf. Trumbull, Conn. : Food & Nutrition Press. 1990. volume 10 (2) page 79-86. 0149-6085
- **Vibrio vulnificus cytolysin induces superoxide anion-initiated apoptotic signaling pathway in human ECV304 cells.**
  Author(s): Department of Physiology, School of Oriental Medicine, Won-Kwang University, Iksan 570-749, Republic of Korea.
  Source: Kwon, K B Yang, J Y Ryu, D G Rho, H W Kim, J S Park, J W Kim, H R Park, B H J-Biol-Chem. 2001 December 14; 276(50): 47518-23 0021-9258
- **Virulence characteristics of clinical and environmental isolates of Vibrio vulnificus.**
  Author(s): Division of Microbiology, U.S. Food and Drug Administration, Washington, D.C. 20204.
  Source: Stelma, G N Reyes, A L Peeler, J T Johnson, C H Spaulding, P L Appl-Environ-Microbiol. 1992 September; 58(9): 2776-82 0099-2240
- **Virulence factors and pathogenicity of Vibrio vulnificus strains isolated from seafood.**
  Source: Garcia Moreno, M.L. Landgraf, M. J-appl-microbiol. Oxford, U.K. : Blackwell Science Ltd. May 1998. volume 84 (5) page 747-751. 1364-5072

Federal Resources on Nutrition

In addition to the IBIDS, the United States Department of Health and Human Services (HHS) and the United States Department of Agriculture (USDA) provide many sources of information on general nutrition and health. Recommended resources include:

- healthfinder®, HHS's gateway to health information, including diet and nutrition:
  http://www.healthfinder.gov/scripts/SearchContext.asp?topic=238&page=0

- The United States Department of Agriculture's Web site dedicated to nutrition information: **www.nutrition.gov**
- The Food and Drug Administration's Web site for federal food safety information: **www.foodsafety.gov**
- The National Action Plan on Overweight and Obesity sponsored by the United States Surgeon General: **http://www.surgeongeneral.gov/topics/obesity/**
- The Center for Food Safety and Applied Nutrition has an Internet site sponsored by the Food and Drug Administration and the Department of Health and Human Services: **http://vm.cfsan.fda.gov/**
- Center for Nutrition Policy and Promotion sponsored by the United States Department of Agriculture: **http://www.usda.gov/cnpp/**
- Food and Nutrition Information Center, National Agricultural Library sponsored by the United States Department of Agriculture: **http://www.nal.usda.gov/fnic/**
- Food and Nutrition Service sponsored by the United States Department of Agriculture: **http://www.fns.usda.gov/fns/**

Additional Web Resources

A number of additional Web sites offer encyclopedic information covering food and nutrition. The following is a representative sample:

- AOL: **http://search.aol.com/cat.adp?id=174&layer=&from=subcats**
- Family Village: **http://www.familyvillage.wisc.edu/med_nutrition.html**
- Google: **http://directory.google.com/Top/Health/Nutrition/**
- Healthnotes: **http://www.thedacare.org/healthnotes/**
- Open Directory Project: **http://dmoz.org/Health/Nutrition/**
- Yahoo.com: **http://dir.yahoo.com/Health/Nutrition/**
- WebMD®Health: **http://my.webmd.com/nutrition**
- WholeHealthMD.com: **http://www.wholehealthmd.com/reflib/0,1529,,00.html**

Vocabulary Builder

The following vocabulary builder defines words used in the references in this chapter that have not been defined in previous chapters:

Capsules: Hard or soft soluble containers used for the oral administration of medicine. [NIH]

Carbohydrate: An aldehyde or ketone derivative of a polyhydric alcohol, particularly of the pentahydric and hexahydric alcohols. They are so named because the hydrogen and oxygen are usually in the proportion to form water, (CH2O)n. The most important carbohydrates are the starches, sugars, celluloses, and gums. They are classified into mono-, di-, tri-, poly- and heterosaccharides. [EU]

Cholesterol: The principal sterol of all higher animals, distributed in body tissues, especially the brain and spinal cord, and in animal fats and oils. [NIH]

Degenerative: Undergoing degeneration : tending to degenerate; having the character of or involving degeneration; causing or tending to cause degeneration. [EU]

Hemolysis: The destruction of erythrocytes by many different causal agents such as antibodies, bacteria, chemicals, temperature, and changes in tonicity. [NIH]

Hypotension: Abnormally low blood pressure; seen in shock but not necessarily indicative of it. [EU]

Iodine: A nonmetallic element of the halogen group that is represented by the atomic symbol I, atomic number 53, and atomic weight of 126.90. It is a nutritionally essential element, especially important in thyroid hormone synthesis. In solution, it has anti-infective properties and is used topically. [NIH]

Necrosis: The sum of the morphological changes indicative of cell death and caused by the progressive degradative action of enzymes; it may affect groups of cells or part of a structure or an organ. [EU]

Neural: 1. pertaining to a nerve or to the nerves. 2. situated in the region of the spinal axis, as the neutral arch. [EU]

Niacin: Water-soluble vitamin of the B complex occurring in various animal and plant tissues. Required by the body for the formation of coenzymes NAD and NADP. Has pellagra-curative, vasodilating, and antilipemic properties. [NIH]

Potassium: An element that is in the alkali group of metals. It has an atomic symbol K, atomic number 19, and atomic weight 39.10. It is the chief cation in the intracellular fluid of muscle and other cells. Potassium ion is a strong

electrolyte and it plays a significant role in the regulation of fluid volume and maintenance of the water-electrolyte balance. [NIH]

Riboflavin: Nutritional factor found in milk, eggs, malted barley, liver, kidney, heart, and leafy vegetables. The richest natural source is yeast. It occurs in the free form only in the retina of the eye, in whey, and in urine; its principal forms in tissues and cells are as FMN and FAD. [NIH]

Sediment: A precipitate, especially one that is formed spontaneously. [EU]

Selenium: An element with the atomic symbol Se, atomic number 34, and atomic weight 78.96. It is an essential micronutrient for mammals and other animals but is toxic in large amounts. Selenium protects intracellular structures against oxidative damage. It is an essential component of glutathione peroxidase. [NIH]

Thyroxine: An amino acid of the thyroid gland which exerts a stimulating effect on thyroid metabolism. [NIH]

APPENDIX D. FINDING MEDICAL LIBRARIES

Overview

At a medical library you can find medical texts and reference books, consumer health publications, specialty newspapers and magazines, as well as medical journals. In this Appendix, we show you how to quickly find a medical library in your area.

Preparation

Before going to the library, highlight the references mentioned in this sourcebook that you find interesting. Focus on those items that are not available via the Internet, and ask the reference librarian for help with your search. He or she may know of additional resources that could be helpful to you. Most importantly, your local public library and medical libraries have Interlibrary Loan programs with the National Library of Medicine (NLM), one of the largest medical collections in the world. According to the NLM, most of the literature in the general and historical collections of the National Library of Medicine is available on interlibrary loan to any library. NLM's interlibrary loan services are only available to libraries. If you would like to access NLM medical literature, then visit a library in your area that can request the publications for you.[46]

[46] Adapted from the NLM: **http://www.nlm.nih.gov/psd/cas/interlibrary.html**.

Finding a Local Medical Library

The quickest method to locate medical libraries is to use the Internet-based directory published by the National Network of Libraries of Medicine (NN/LM). This network includes 4626 members and affiliates that provide many services to librarians, health professionals, and the public. To find a library in your area, simply visit **http://nnlm.gov/members/adv.html** or call 1-800-338-7657.

Medical Libraries Open to the Public

In addition to the NN/LM, the National Library of Medicine (NLM) lists a number of libraries that are generally open to the public and have reference facilities. The following is the NLM's list plus hyperlinks to each library Web site. These Web pages can provide information on hours of operation and other restrictions. The list below is a small sample of libraries recommended by the National Library of Medicine (sorted alphabetically by name of the U.S. state or Canadian province where the library is located):[47]

- **Alabama:** Health InfoNet of Jefferson County (Jefferson County Library Cooperative, Lister Hill Library of the Health Sciences), **http://www.uab.edu/infonet/**
- **Alabama:** Richard M. Scrushy Library (American Sports Medicine Institute), **http://www.asmi.org/LIBRARY.HTM**
- **Arizona:** Samaritan Regional Medical Center: The Learning Center (Samaritan Health System, Phoenix, Arizona), **http://www.samaritan.edu/library/bannerlibs.htm**
- **California:** Kris Kelly Health Information Center (St. Joseph Health System), **http://www.humboldt1.com/~kkhic/index.html**
- **California:** Community Health Library of Los Gatos (Community Health Library of Los Gatos), **http://www.healthlib.org/orgresources.html**
- **California:** Consumer Health Program and Services (CHIPS) (County of Los Angeles Public Library, Los Angeles County Harbor-UCLA Medical Center Library) - Carson, CA, **http://www.colapublib.org/services/chips.html**
- **California:** Gateway Health Library (Sutter Gould Medical Foundation)
- **California:** Health Library (Stanford University Medical Center), **http://www-med.stanford.edu/healthlibrary/**

[47] Abstracted from **http://www.nlm.nih.gov/medlineplus/libraries.html**.

- **California:** Patient Education Resource Center - Health Information and Resources (University of California, San Francisco), **http://sfghdean.ucsf.edu/barnett/PERC/default.asp**
- **California:** Redwood Health Library (Petaluma Health Care District), **http://www.phcd.org/rdwdlib.html**
- **California:** San José PlaneTree Health Library, **http://planetreesanjose.org/**
- **California:** Sutter Resource Library (Sutter Hospitals Foundation), **http://go.sutterhealth.org/comm/resc-library/sac-resources.html**
- **California:** University of California, Davis. Health Sciences Libraries
- **California:** ValleyCare Health Library & Ryan Comer Cancer Resource Center (ValleyCare Health System), **http://www.valleycare.com/library.html**
- **California:** Washington Community Health Resource Library (Washington Community Health Resource Library), **http://www.healthlibrary.org/**
- **Colorado:** William V. Gervasini Memorial Library (Exempla Healthcare), **http://www.exempla.org/conslib.htm**
- **Connecticut:** Hartford Hospital Health Science Libraries (Hartford Hospital), **http://www.harthosp.org/library/**
- **Connecticut:** Healthnet: Connecticut Consumer Health Information Center (University of Connecticut Health Center, Lyman Maynard Stowe Library), **http://library.uchc.edu/departm/hnet/**
- **Connecticut:** Waterbury Hospital Health Center Library (Waterbury Hospital), **http://www.waterburyhospital.com/library/consumer.shtml**
- **Delaware:** Consumer Health Library (Christiana Care Health System, Eugene du Pont Preventive Medicine & Rehabilitation Institute), **http://www.christianacare.org/health_guide/health_guide_pmri_health_info.cfm**
- **Delaware:** Lewis B. Flinn Library (Delaware Academy of Medicine), **http://www.delamed.org/chls.html**
- **Georgia:** Family Resource Library (Medical College of Georgia), **http://cmc.mcg.edu/kids_families/fam_resources/fam_res_lib/frl.htm**
- **Georgia:** Health Resource Center (Medical Center of Central Georgia), **http://www.mccg.org/hrc/hrchome.asp**
- **Hawaii:** Hawaii Medical Library: Consumer Health Information Service (Hawaii Medical Library), **http://hml.org/CHIS/**

- **Idaho:** DeArmond Consumer Health Library (Kootenai Medical Center), **http://www.nicon.org/DeArmond/index.htm**
- **Illinois:** Health Learning Center of Northwestern Memorial Hospital (Northwestern Memorial Hospital, Health Learning Center), **http://www.nmh.org/health_info/hlc.html**
- **Illinois:** Medical Library (OSF Saint Francis Medical Center), **http://www.osfsaintfrancis.org/general/library/**
- **Kentucky:** Medical Library - Services for Patients, Families, Students & the Public (Central Baptist Hospital), **http://www.centralbap.com/education/community/library.htm**
- **Kentucky:** University of Kentucky - Health Information Library (University of Kentucky, Chandler Medical Center, Health Information Library), **http://www.mc.uky.edu/PatientEd/**
- **Louisiana:** Alton Ochsner Medical Foundation Library (Alton Ochsner Medical Foundation), **http://www.ochsner.org/library/**
- **Louisiana:** Louisiana State University Health Sciences Center Medical Library-Shreveport, **http://lib-sh.lsuhsc.edu/**
- **Maine:** Franklin Memorial Hospital Medical Library (Franklin Memorial Hospital), **http://www.fchn.org/fmh/lib.htm**
- **Maine:** Gerrish-True Health Sciences Library (Central Maine Medical Center), **http://www.cmmc.org/library/library.html**
- **Maine:** Hadley Parrot Health Science Library (Eastern Maine Healthcare), **http://www.emh.org/hll/hpl/guide.htm**
- **Maine:** Maine Medical Center Library (Maine Medical Center), **http://www.mmc.org/library/**
- **Maine:** Parkview Hospital, **http://www.parkviewhospital.org/communit.htm#Library**
- **Maine:** Southern Maine Medical Center Health Sciences Library (Southern Maine Medical Center), **http://www.smmc.org/services/service.php3?choice=10**
- **Maine:** Stephens Memorial Hospital Health Information Library (Western Maine Health), **http://www.wmhcc.com/hil_frame.html**
- **Manitoba, Canada:** Consumer & Patient Health Information Service (University of Manitoba Libraries), **http://www.umanitoba.ca/libraries/units/health/reference/chis.html**
- **Manitoba, Canada:** J.W. Crane Memorial Library (Deer Lodge Centre), **http://www.deerlodge.mb.ca/library/libraryservices.shtml**

- **Maryland:** Health Information Center at the Wheaton Regional Library (Montgomery County, Md., Dept. of Public Libraries, Wheaton Regional Library), **http://www.mont.lib.md.us/healthinfo/hic.asp**
- **Massachusetts:** Baystate Medical Center Library (Baystate Health System), **http://www.baystatehealth.com/1024/**
- **Massachusetts:** Boston University Medical Center Alumni Medical Library (Boston University Medical Center), **http://med-libwww.bu.edu/library/lib.html**
- **Massachusetts:** Lowell General Hospital Health Sciences Library (Lowell General Hospital), **http://www.lowellgeneral.org/library/HomePageLinks/WWW.htm**
- **Massachusetts:** Paul E. Woodard Health Sciences Library (New England Baptist Hospital), **http://www.nebh.org/health_lib.asp**
- **Massachusetts:** St. Luke's Hospital Health Sciences Library (St. Luke's Hospital), **http://www.southcoast.org/library/**
- **Massachusetts:** Treadwell Library Consumer Health Reference Center (Massachusetts General Hospital), **http://www.mgh.harvard.edu/library/chrcindex.html**
- **Massachusetts:** UMass HealthNet (University of Massachusetts Medical School), **http://healthnet.umassmed.edu/**
- **Michigan:** Botsford General Hospital Library - Consumer Health (Botsford General Hospital, Library & Internet Services), **http://www.botsfordlibrary.org/consumer.htm**
- **Michigan:** Helen DeRoy Medical Library (Providence Hospital and Medical Centers), **http://www.providence-hospital.org/library/**
- **Michigan:** Marquette General Hospital - Consumer Health Library (Marquette General Hospital, Health Information Center), **http://www.mgh.org/center.html**
- **Michigan:** Patient Education Resouce Center - University of Michigan Cancer Center (University of Michigan Comprehensive Cancer Center), **http://www.cancer.med.umich.edu/learn/leares.htm**
- **Michigan:** Sladen Library & Center for Health Information Resources - Consumer Health Information, **http://www.sladen.hfhs.org/library/consumer/index.html**
- **Montana:** Center for Health Information (St. Patrick Hospital and Health Sciences Center), **http://www.saintpatrick.org/chi/librarydetail.php3?ID=41**

- **National:** Consumer Health Library Directory (Medical Library Association, Consumer and Patient Health Information Section), **http://caphis.mlanet.org/directory/index.html**
- **National:** National Network of Libraries of Medicine (National Library of Medicine) - provides library services for health professionals in the United States who do not have access to a medical library, **http://nnlm.gov/**
- **National:** NN/LM List of Libraries Serving the Public (National Network of Libraries of Medicine), **http://nnlm.gov/members/**
- **Nevada:** Health Science Library, West Charleston Library (Las Vegas Clark County Library District), **http://www.lvccld.org/special_collections/medical/index.htm**
- **New Hampshire:** Dartmouth Biomedical Libraries (Dartmouth College Library), **http://www.dartmouth.edu/~biomed/resources.htmld/conshealth.htmld/**
- **New Jersey:** Consumer Health Library (Rahway Hospital), **http://www.rahwayhospital.com/library.htm**
- **New Jersey:** Dr. Walter Phillips Health Sciences Library (Englewood Hospital and Medical Center), **http://www.englewoodhospital.com/links/index.htm**
- **New Jersey:** Meland Foundation (Englewood Hospital and Medical Center), **http://www.geocities.com/ResearchTriangle/9360/**
- **New York:** Choices in Health Information (New York Public Library) - NLM Consumer Pilot Project participant, **http://www.nypl.org/branch/health/links.html**
- **New York:** Health Information Center (Upstate Medical University, State University of New York), **http://www.upstate.edu/library/hic/**
- **New York:** Health Sciences Library (Long Island Jewish Medical Center), **http://www.lij.edu/library/library.html**
- **New York:** ViaHealth Medical Library (Rochester General Hospital), **http://www.nyam.org/library/**
- **Ohio:** Consumer Health Library (Akron General Medical Center, Medical & Consumer Health Library), **http://www.akrongeneral.org/hwlibrary.htm**
- **Oklahoma:** Saint Francis Health System Patient/Family Resource Center (Saint Francis Health System), **http://www.sfh-tulsa.com/patientfamilycenter/default.asp**

- **Oregon:** Planetree Health Resource Center (Mid-Columbia Medical Center), **http://www.mcmc.net/phrc/**
- **Pennsylvania:** Community Health Information Library (Milton S. Hershey Medical Center), **http://www.hmc.psu.edu/commhealth/**
- **Pennsylvania:** Community Health Resource Library (Geisinger Medical Center), **http://www.geisinger.edu/education/commlib.shtml**
- **Pennsylvania:** HealthInfo Library (Moses Taylor Hospital), **http://www.mth.org/healthwellness.html**
- **Pennsylvania:** Hopwood Library (University of Pittsburgh, Health Sciences Library System), **http://www.hsls.pitt.edu/chi/hhrcinfo.html**
- **Pennsylvania:** Koop Community Health Information Center (College of Physicians of Philadelphia), **http://www.collphyphil.org/kooppg1.shtml**
- **Pennsylvania:** Learning Resources Center - Medical Library (Susquehanna Health System), **http://www.shscares.org/services/lrc/index.asp**
- **Pennsylvania:** Medical Library (UPMC Health System), **http://www.upmc.edu/passavant/library.htm**
- **Quebec, Canada:** Medical Library (Montreal General Hospital), **http://ww2.mcgill.ca/mghlib/**
- **South Dakota:** Rapid City Regional Hospital - Health Information Center (Rapid City Regional Hospital, Health Information Center), **http://www.rcrh.org/education/LibraryResourcesConsumers.htm**
- **Texas:** Houston HealthWays (Houston Academy of Medicine-Texas Medical Center Library), **http://hhw.library.tmc.edu/**
- **Texas:** Matustik Family Resource Center (Cook Children's Health Care System), **http://www.cookchildrens.com/Matustik_Library.html**
- **Washington:** Community Health Library (Kittitas Valley Community Hospital), **http://www.kvch.com/**
- **Washington:** Southwest Washington Medical Center Library (Southwest Washington Medical Center), **http://www.swmedctr.com/Home/**

APPENDIX E. YOUR RIGHTS AND INSURANCE

Overview

Any patient with Vibrio vulnificus infection faces a series of issues related more to the healthcare industry than to the medical condition itself. This appendix covers two important topics in this regard: your rights and responsibilities as a patient, and how to get the most out of your medical insurance plan.

Your Rights as a Patient

The President's Advisory Commission on Consumer Protection and Quality in the Healthcare Industry has created the following summary of your rights as a patient.[48]

Information Disclosure

Consumers have the right to receive accurate, easily understood information. Some consumers require assistance in making informed decisions about health plans, health professionals, and healthcare facilities. Such information includes:

- ***Health plans.*** Covered benefits, cost-sharing, and procedures for resolving complaints, licensure, certification, and accreditation status, comparable measures of quality and consumer satisfaction, provider

[48]Adapted from Consumer Bill of Rights and Responsibilities: **http://www.hcqualitycommission.gov/press/cbor.html#head1**.

network composition, the procedures that govern access to specialists and emergency services, and care management information.

- ***Health professionals.*** Education, board certification, and recertification, years of practice, experience performing certain procedures, and comparable measures of quality and consumer satisfaction.
- ***Healthcare facilities.*** Experience in performing certain procedures and services, accreditation status, comparable measures of quality, worker, and consumer satisfaction, and procedures for resolving complaints.
- ***Consumer assistance programs.*** Programs must be carefully structured to promote consumer confidence and to work cooperatively with health plans, providers, payers, and regulators. Desirable characteristics of such programs are sponsorship that ensures accountability to the interests of consumers and stable, adequate funding.

Choice of Providers and Plans

Consumers have the right to a choice of healthcare providers that is sufficient to ensure access to appropriate high-quality healthcare. To ensure such choice, the Commission recommends the following:

- ***Provider network adequacy.*** All health plan networks should provide access to sufficient numbers and types of providers to assure that all covered services will be accessible without unreasonable delay -- including access to emergency services 24 hours a day and 7 days a week. If a health plan has an insufficient number or type of providers to provide a covered benefit with the appropriate degree of specialization, the plan should ensure that the consumer obtains the benefit outside the network at no greater cost than if the benefit were obtained from participating providers.
- ***Women's health services.*** Women should be able to choose a qualified provider offered by a plan -- such as gynecologists, certified nurse midwives, and other qualified healthcare providers -- for the provision of covered care necessary to provide routine and preventative women's healthcare services.
- ***Access to specialists.*** Consumers with complex or serious medical conditions who require frequent specialty care should have direct access to a qualified specialist of their choice within a plan's network of providers. Authorizations, when required, should be for an adequate number of direct access visits under an approved treatment plan.

- ***Transitional care.*** Consumers who are undergoing a course of treatment for a chronic or disabling condition (or who are in the second or third trimester of a pregnancy) at the time they involuntarily change health plans or at a time when a provider is terminated by a plan for other than cause should be able to continue seeing their current specialty providers for up to 90 days (or through completion of postpartum care) to allow for transition of care.
- ***Choice of health plans.*** Public and private group purchasers should, wherever feasible, offer consumers a choice of high-quality health insurance plans.

Access to Emergency Services

Consumers have the right to access emergency healthcare services when and where the need arises. Health plans should provide payment when a consumer presents to an emergency department with acute symptoms of sufficient severity--including severe pain--such that a "prudent layperson" could reasonably expect the absence of medical attention to result in placing that consumer's health in serious jeopardy, serious impairment to bodily functions, or serious dysfunction of any bodily organ or part.

Participation in Treatment Decisions

Consumers have the right and responsibility to fully participate in all decisions related to their healthcare. Consumers who are unable to fully participate in treatment decisions have the right to be represented by parents, guardians, family members, or other conservators. Physicians and other health professionals should:

- Provide patients with sufficient information and opportunity to decide among treatment options consistent with the informed consent process.
- Discuss all treatment options with a patient in a culturally competent manner, including the option of no treatment at all.
- Ensure that persons with disabilities have effective communications with members of the health system in making such decisions.
- Discuss all current treatments a consumer may be undergoing.
- Discuss all risks, benefits, and consequences to treatment or nontreatment.

- Give patients the opportunity to refuse treatment and to express preferences about future treatment decisions.
- Discuss the use of advance directives -- both living wills and durable powers of attorney for healthcare -- with patients and their designated family members.
- Abide by the decisions made by their patients and/or their designated representatives consistent with the informed consent process.

Health plans, health providers, and healthcare facilities should:

- Disclose to consumers factors -- such as methods of compensation, ownership of or interest in healthcare facilities, or matters of conscience -- that could influence advice or treatment decisions.
- Assure that provider contracts do not contain any so-called "gag clauses" or other contractual mechanisms that restrict healthcare providers' ability to communicate with and advise patients about medically necessary treatment options.
- Be prohibited from penalizing or seeking retribution against healthcare professionals or other health workers for advocating on behalf of their patients.

Respect and Nondiscrimination

Consumers have the right to considerate, respectful care from all members of the healthcare industry at all times and under all circumstances. An environment of mutual respect is essential to maintain a quality healthcare system. To assure that right, the Commission recommends the following:

- Consumers must not be discriminated against in the delivery of healthcare services consistent with the benefits covered in their policy, or as required by law, based on race, ethnicity, national origin, religion, sex, age, mental or physical disability, sexual orientation, genetic information, or source of payment.
- Consumers eligible for coverage under the terms and conditions of a health plan or program, or as required by law, must not be discriminated against in marketing and enrollment practices based on race, ethnicity, national origin, religion, sex, age, mental or physical disability, sexual orientation, genetic information, or source of payment.

Confidentiality of Health Information

Consumers have the right to communicate with healthcare providers in confidence and to have the confidentiality of their individually identifiable healthcare information protected. Consumers also have the right to review and copy their own medical records and request amendments to their records.

Complaints and Appeals

Consumers have the right to a fair and efficient process for resolving differences with their health plans, healthcare providers, and the institutions that serve them, including a rigorous system of internal review and an independent system of external review. A free copy of the Patient's Bill of Rights is available from the American Hospital Association.[49]

Patient Responsibilities

Treatment is a two-way street between you and your healthcare providers. To underscore the importance of finance in modern healthcare as well as your responsibility for the financial aspects of your care, the President's Advisory Commission on Consumer Protection and Quality in the Healthcare Industry has proposed that patients understand the following "Consumer Responsibilities."[50] In a healthcare system that protects consumers' rights, it is reasonable to expect and encourage consumers to assume certain responsibilities. Greater individual involvement by the consumer in his or her care increases the likelihood of achieving the best outcome and helps support a quality-oriented, cost-conscious environment. Such responsibilities include:

- Take responsibility for maximizing healthy habits such as exercising, not smoking, and eating a healthy diet.
- Work collaboratively with healthcare providers in developing and carrying out agreed-upon treatment plans.

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[49] To order your free copy of the Patient's Bill of Rights, telephone 312-422-3000 or visit the American Hospital Association's Web site: **http://www.aha.org**. Click on "Resource Center," go to "Search" at bottom of page, and then type in "Patient's Bill of Rights." The Patient's Bill of Rights is also available from Fax on Demand, at 312-422-2020, document number 471124.

[50] Adapted from **http://www.hcqualitycommission.gov/press/cbor.html#head1**.

- Disclose relevant information and clearly communicate wants and needs.
- Use your health insurance plan's internal complaint and appeal processes to address your concerns.
- Avoid knowingly spreading disease.
- Recognize the reality of risks, the limits of the medical science, and the human fallibility of the healthcare professional.
- Be aware of a healthcare provider's obligation to be reasonably efficient and equitable in providing care to other patients and the community.
- Become knowledgeable about your health plan's coverage and options (when available) including all covered benefits, limitations, and exclusions, rules regarding use of network providers, coverage and referral rules, appropriate processes to secure additional information, and the process to appeal coverage decisions.
- Show respect for other patients and health workers.
- Make a good-faith effort to meet financial obligations.
- Abide by administrative and operational procedures of health plans, healthcare providers, and Government health benefit programs.

Choosing an Insurance Plan

There are a number of official government agencies that help consumers understand their healthcare insurance choices.[51] The U.S. Department of Labor, in particular, recommends ten ways to make your health benefits choices work best for you.[52]

1. Your options are important. There are many different types of health benefit plans. Find out which one your employer offers, then check out the plan, or plans, offered. Your employer's human resource office, the health plan administrator, or your union can provide information to help you match your needs and preferences with the available plans. The more information you have, the better your healthcare decisions will be.

2. Reviewing the benefits available. Do the plans offered cover preventive care, well-baby care, vision or dental care? Are there deductibles? Answers

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[51] More information about quality across programs is provided at the following AHRQ Web site:
http://www.ahrq.gov/consumer/qntascii/qnthplan.htm.

[52] Adapted from the Department of Labor:
http://www.dol.gov/dol/pwba/public/pubs/health/top10-text.html.

to these questions can help determine the out-of-pocket expenses you may face. Matching your needs and those of your family members will result in the best possible benefits. Cheapest may not always be best. Your goal is high quality health benefits.

3. Look for quality. The quality of healthcare services varies, but quality can be measured. You should consider the quality of healthcare in deciding among the healthcare plans or options available to you. Not all health plans, doctors, hospitals and other providers give the highest quality care. Fortunately, there is quality information you can use right now to help you compare your healthcare choices. Find out how you can measure quality. Consult the U.S. Department of Health and Human Services publication "Your Guide to Choosing Quality Health Care" on the Internet at **www.ahcpr.gov/consumer**.

4. Your plan's summary plan description (SPD) provides a wealth of information. Your health plan administrator can provide you with a copy of your plan's SPD. It outlines your benefits and your legal rights under the Employee Retirement Income Security Act (ERISA), the federal law that protects your health benefits. It should contain information about the coverage of dependents, what services will require a co-pay, and the circumstances under which your employer can change or terminate a health benefits plan. Save the SPD and all other health plan brochures and documents, along with memos or correspondence from your employer relating to health benefits.

5. Assess your benefit coverage as your family status changes. Marriage, divorce, childbirth or adoption, and the death of a spouse are all life events that may signal a need to change your health benefits. You, your spouse and dependent children may be eligible for a special enrollment period under provisions of the Health Insurance Portability and Accountability Act (HIPAA). Even without life-changing events, the information provided by your employer should tell you how you can change benefits or switch plans, if more than one plan is offered. If your spouse's employer also offers a health benefits package, consider coordinating both plans for maximum coverage.

6. Changing jobs and other life events can affect your health benefits. Under the Consolidated Omnibus Budget Reconciliation Act (COBRA), you, your covered spouse, and your dependent children may be eligible to purchase extended health coverage under your employer's plan if you lose your job, change employers, get divorced, or upon occurrence of certain other events. Coverage can range from 18 to 36 months depending on your

situation. COBRA applies to most employers with 20 or more workers and requires your plan to notify you of your rights. Most plans require eligible individuals to make their COBRA election within 60 days of the plan's notice. Be sure to follow up with your plan sponsor if you don't receive notice, and make sure you respond within the allotted time.

7. HIPAA can also help if you are changing jobs, particularly if you have a medical condition. HIPAA generally limits pre-existing condition exclusions to a maximum of 12 months (18 months for late enrollees). HIPAA also requires this maximum period to be reduced by the length of time you had prior "creditable coverage." You should receive a certificate documenting your prior creditable coverage from your old plan when coverage ends.

8. Plan for retirement. Before you retire, find out what health benefits, if any, extend to you and your spouse during your retirement years. Consult with your employer's human resources office, your union, the plan administrator, and check your SPD. Make sure there is no conflicting information among these sources about the benefits you will receive or the circumstances under which they can change or be eliminated. With this information in hand, you can make other important choices, like finding out if you are eligible for Medicare and Medigap insurance coverage.

9. Know how to file an appeal if your health benefits claim is denied. Understand how your plan handles grievances and where to make appeals of the plan's decisions. Keep records and copies of correspondence. Check your health benefits package and your SPD to determine who is responsible for handling problems with benefit claims. Contact PWBA for customer service assistance if you are unable to obtain a response to your complaint.

10. You can take steps to improve the quality of the healthcare and the health benefits you receive. Look for and use things like Quality Reports and Accreditation Reports whenever you can. Quality reports may contain consumer ratings -- how satisfied consumers are with the doctors in their plan, for instance-- and clinical performance measures -- how well a healthcare organization prevents and treats illness. Accreditation reports provide information on how accredited organizations meet national standards, and often include clinical performance measures. Look for these quality measures whenever possible. Consult "Your Guide to Choosing Quality Health Care" on the Internet at **www.ahcpr.gov/consumer**.

Medicare and Medicaid

Illness strikes both rich and poor families. For low-income families, Medicaid is available to defer the costs of treatment. The Health Care Financing Administration (HCFA) administers Medicare, the nation's largest health insurance program, which covers 39 million Americans. In the following pages, you will learn the basics about Medicare insurance as well as useful contact information on how to find more in-depth information about Medicaid.[53]

Who is Eligible for Medicare?

Generally, you are eligible for Medicare if you or your spouse worked for at least 10 years in Medicare-covered employment and you are 65 years old and a citizen or permanent resident of the United States. You might also qualify for coverage if you are under age 65 but have a disability or End-Stage Renal disease (permanent kidney failure requiring dialysis or transplant). Here are some simple guidelines:

You can get Part A at age 65 without having to pay premiums if:

- You are already receiving retirement benefits from Social Security or the Railroad Retirement Board.
- You are eligible to receive Social Security or Railroad benefits but have not yet filed for them.
- You or your spouse had Medicare-covered government employment.

If you are under 65, you can get Part A without having to pay premiums if:

- You have received Social Security or Railroad Retirement Board disability benefit for 24 months.
- You are a kidney dialysis or kidney transplant patient.

Medicare has two parts:

- Part A (Hospital Insurance). Most people do not have to pay for Part A.
- Part B (Medical Insurance). Most people pay monthly for Part B.

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[53] This section has been adapted from the Official U.S. Site for Medicare Information: **http://www.medicare.gov/Basics/Overview.asp**.

Part A (Hospital Insurance)

Helps Pay For: Inpatient hospital care, care in critical access hospitals (small facilities that give limited outpatient and inpatient services to people in rural areas) and skilled nursing facilities, hospice care, and some home healthcare.

Cost: Most people get Part A automatically when they turn age 65. You do not have to pay a monthly payment called a premium for Part A because you or a spouse paid Medicare taxes while you were working.

If you (or your spouse) did not pay Medicare taxes while you were working and you are age 65 or older, you still may be able to buy Part A. If you are not sure you have Part A, look on your red, white, and blue Medicare card. It will show "Hospital Part A" on the lower left corner of the card. You can also call the Social Security Administration toll free at 1-800-772-1213 or call your local Social Security office for more information about buying Part A. If you get benefits from the Railroad Retirement Board, call your local RRB office or 1-800-808-0772. For more information, call your Fiscal Intermediary about Part A bills and services. The phone number for the Fiscal Intermediary office in your area can be obtained from the following Web site: **http://www.medicare.gov/Contacts/home.asp**.

Part B (Medical Insurance)

Helps Pay For: Doctors, services, outpatient hospital care, and some other medical services that Part A does not cover, such as the services of physical and occupational therapists, and some home healthcare. Part B helps pay for covered services and supplies when they are medically necessary.

Cost: As of 2001, you pay the Medicare Part B premium of $50.00 per month. In some cases this amount may be higher if you did not choose Part B when you first became eligible at age 65. The cost of Part B may go up 10% for each 12-month period that you were eligible for Part B but declined coverage, except in special cases. You will have to pay the extra 10% cost for the rest of your life.

Enrolling in Part B is your choice. You can sign up for Part B anytime during a 7-month period that begins 3 months before you turn 65. Visit your local Social Security office, or call the Social Security Administration at 1-800-772-1213 to sign up. If you choose to enroll in Part B, the premium is usually taken out of your monthly Social Security, Railroad Retirement, or Civil Service Retirement payment. If you do not receive any of the above

payments, Medicare sends you a bill for your part B premium every 3 months. You should receive your Medicare premium bill in the mail by the 10th of the month. If you do not, call the Social Security Administration at 1-800-772-1213, or your local Social Security office. If you get benefits from the Railroad Retirement Board, call your local RRB office or 1-800-808-0772. For more information, call your Medicare carrier about bills and services. The phone number for the Medicare carrier in your area can be found at the following Web site: **http://www.medicare.gov/Contacts/home.asp**. You may have choices in how you get your healthcare including the Original Medicare Plan, Medicare Managed Care Plans (like HMOs), and Medicare Private Fee-for-Service Plans.

Medicaid

Medicaid is a joint federal and state program that helps pay medical costs for some people with low incomes and limited resources. Medicaid programs vary from state to state. People on Medicaid may also get coverage for nursing home care and outpatient prescription drugs which are not covered by Medicare. You can find more information about Medicaid on the HCFA.gov Web site at **http://www.hcfa.gov/medicaid/medicaid.htm**.

States also have programs that pay some or all of Medicare's premiums and may also pay Medicare deductibles and coinsurance for certain people who have Medicare and a low income. To qualify, you must have:

- Part A (Hospital Insurance),
- Assets, such as bank accounts, stocks, and bonds that are not more than $4,000 for a single person, or $6,000 for a couple, and
- A monthly income that is below certain limits.

For more information on these programs, look at the Medicare Savings Programs brochure, **http://www.medicare.gov/Library/PDFNavigation/PDFInterim.asp?Language=English&Type=Pub&PubID=10126**. There are also Prescription Drug Assistance Programs available. Find information on these programs which offer discounts or free medications to individuals in need at **http://www.medicare.gov/Prescription/Home.asp**.

NORD's Medication Assistance Programs

Finally, the National Organization for Rare Disorders, Inc. (NORD) administers medication programs sponsored by humanitarian-minded pharmaceutical and biotechnology companies to help uninsured or under-insured individuals secure life-saving or life-sustaining drugs.[54] NORD programs ensure that certain vital drugs are available "to those individuals whose income is too high to qualify for Medicaid but too low to pay for their prescribed medications." The program has standards for fairness, equity, and unbiased eligibility. It currently covers some 14 programs for nine pharmaceutical companies. NORD also offers early access programs for investigational new drugs (IND) under the approved "Treatment INDs" programs of the Food and Drug Administration (FDA). In these programs, a limited number of individuals can receive investigational drugs that have yet to be approved by the FDA. These programs are generally designed for rare diseases or disorders. For more information, visit **www.rarediseases.org**.

Additional Resources

In addition to the references already listed in this chapter, you may need more information on health insurance, hospitals, or the healthcare system in general. The NIH has set up an excellent guidance Web site that addresses these and other issues. Topics include:[55]

- Health Insurance: **http://www.nlm.nih.gov/medlineplus/healthinsurance.html**
- Health Statistics: **http://www.nlm.nih.gov/medlineplus/healthstatistics.html**
- HMO and Managed Care: **http://www.nlm.nih.gov/medlineplus/managedcare.html**
- Hospice Care: **http://www.nlm.nih.gov/medlineplus/hospicecare.html**
- Medicaid: **http://www.nlm.nih.gov/medlineplus/medicaid.html**
- Medicare: **http://www.nlm.nih.gov/medlineplus/medicare.html**
- Nursing Homes and Long-term Care: **http://www.nlm.nih.gov/medlineplus/nursinghomes.html**

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[54] Adapted from NORD: **http://www.rarediseases.org/cgi-bin/nord/progserv#patient?id=rPIzL9oD&mv_pc=30**.

[55] You can access this information at: **http://www.nlm.nih.gov/medlineplus/healthsystem.html**.

- Patient's Rights, Confidentiality, Informed Consent, Ombudsman Programs, Privacy and Patient Issues: **http://www.nlm.nih.gov/medlineplus/patientissues.html**
- Veteran's Health, Persian Gulf War, Gulf War Syndrome, Agent Orange: **http://www.nlm.nih.gov/medlineplus/veteranshealth.html**

APPENDIX F. MORE ON FOODBORNE DISEASES

Overview[56]

Foodborne diseases are caused by consuming contaminated foods or beverages. Many different disease-causing microbes, or pathogens, can contaminate foods, so there are many different foodborne infections. In addition, poisonous chemicals, or other harmful substances can cause foodborne diseases if they are present in food.

More than 250 different foodborne diseases have been described. Most of these diseases are infections, caused by a variety of bacteria, viruses, and parasites that can be foodborne. Other diseases are poisonings, caused by harmful toxins or chemicals that have contaminated the food, for example, poisonous mushrooms. These different diseases have many different symptoms, so there is no one "syndrome" that is foodborne illness. However, the microbe or toxin enters the body through the gastrointestinal tract, and often causes the first symptoms there, so nausea, vomiting, abdominal cramps and diarrhea are common symptoms in many foodborne diseases.

Many microbes can spread in more than one way, so we cannot always know that a disease is foodborne. The distinction matters, because public health authorities need to know how a particular disease is spreading to take the appropriate steps to stop it. For example, Escherichia coli O157:H7 infections can spread through contaminated food, contaminated drinking water, contaminated swimming water, and from toddler to toddler at a day care center. Depending on which means of spread caused a case, the

[56] Adapted from The Centers for Disease Control and Prevention (CDC): **http://www.cdc.gov/ncidod/dbmd/diseaseinfo/foodborneinfections_g.htm**.

measures to stop other cases from occurring could range from removing contaminated food from stores, chlorinating a swimming pool, or closing a child day care center.

What Are the Most Common Foodborne Diseases?

The most commonly recognized foodborne infections are those caused by the bacteria Campylobacter, Salmonella, and E. coli O157:H7, and by a group of viruses called calicivirus, also known as the Norwalk and Norwalk-like viruses.

Campylobacter

Campylobacter is a bacterial pathogen that causes fever, diarrhea, and abdominal cramps. It is the most commonly identified bacterial cause of diarrheal illness in the world. These bacteria live in the intestines of healthy birds, and most raw poultry meat has Campylobacter on it. Eating undercooked chicken, or other food that has been contaminated with juices dripping from raw chicken is the most frequent source of this infection.

Salmonella

Salmonella is also a bacterium that is widespread in the intestines of birds, reptiles and mammals. It can spread to humans via a variety of different foods of animal origin. The illness it causes, salmonellosis, typically includes fever, diarrhea and abdominal cramps. In persons with poor underlying health or weakened immune systems, it can invade the bloodstream and cause life-threatening infections.

E. Coli O157:H7

E. coli O157:H7 is a bacterial pathogen that has a reservoir in cattle and other similar animals. Human illness typically follows consumption of food or water that has been contaminated with microscopic amounts of cow feces. The illness it causes is often a severe and bloody diarrhea and painful abdominal cramps, without much fever. In 3% to 5% of cases, a complication called hemolytic uremic syndrome (HUS) can occur several weeks after the initial symptoms. This severe complication includes temporary anemia, profuse bleeding, and kidney failure.

Calicivirus

Calicivirus, or Norwalk-like virus is an extremely common cause of foodborne illness, though it is rarely diagnosed, because the laboratory test is not widely available. It causes an acute gastrointestinal illness, usually with more vomiting than diarrhea, that resolves within two days. Unlike many foodborne pathogens that have animal reservoirs, it is believed that Norwalk-like viruses spread primarily from one infected person to another. Infected kitchen workers can contaminate a salad or sandwich as they prepare it, if they have the virus on their hands. Infected fishermen have contaminated oysters as they harvested them.

Other Common Foodborne Diseases

Some common diseases are occasionally foodborne, even though they are usually transmitted by other routes. These include infections caused by Shigella, hepatitis A, and the parasites Giardia lamblia and Cryptosporidia. Even Strep throats have been transmitted occasionally through food.

In addition to disease caused by direct infection, some foodborne diseases are caused by the presence of a toxin in the food that was produced by a microbe in the food. For example, the bacterium Staphylococcus aureus can grow in some foods and produce a toxin that causes intense vomiting. The rare but deadly disease botulism occurs when the bacterium Clostridium botulinum grows and produces a powerful paralytic toxin in foods. These toxins can produce illness even if the microbes that produced them are no longer there.

Other toxins and poisonous chemicals can cause foodborne illness. People can become ill if a pesticide is inadvertently added to a food, or if naturally poisonous substances are used to prepare a meal. Every year, people become ill after mistaking poisonous mushrooms for safe species, or after eating poisonous reef fishes.

Are the Types of Foodborne Diseases Changing?

The spectrum of foodborne diseases is constantly changing. A century ago, typhoid fever, tuberculosis and cholera were common foodborne diseases. Improvements in food safety, such as pasteurization of milk, safe canning, and disinfection of water supplies have conquered those diseases. Today other foodborne infections have taken their place, including some that have

only recently been discovered. For example, in 1996, the parasite Cyclospora suddenly appeared as a cause of diarrheal illness related to Guatemalan raspberries. These berries had just started to be grown commercially in Guatemala, and somehow became contaminated in the field there with this unusual parasite. In 1998, a new strain of the bacterium Vibrio parahemolyticus contaminated oyster beds in Galveston Bay and caused an epidemic of diarrheal illness in persons eating the oysters raw. The affected oyster beds were near the shipping lanes, which suggested that the bacterium arrived in the ballast water of freighters and tankers coming into the harbor from distant ports. Newly recognized microbes emerge as public health problems for several reasons: microbes can easily spread around the world, new microbes can evolve, the environment and ecology are changing, food production practices and consumption habits change, and because better laboratory tests can now identify microbes that were previously unrecognized.

In the last 15 years, several important diseases of unknown cause have turned out to be complications of foodborne infections. For example, we now know that the Guillain-Barre syndrome can be caused by Campylobacter infection, and that the most common cause of acute kidney failure in children, hemolytic uremic syndrome, is caused by infection with E. coli O157:H7 and related bacteria. In the future, other diseases whose origins are currently unknown may turn out be related to foodborne infections.

What Happens After the Microbes That Produce Illness Are Swallowed?

After they are swallowed, there is a delay, called the incubation period, before the symptoms of illness begin. This delay may range from hours to days, depending on the organism, and on how many of them were swallowed. During the incubation period, the microbes pass through the stomach into the intestine, attach to the cells lining the intestinal walls, and begin to multiply there. Some types of microbes stay in the intestine, some produce a toxin that is absorbed into the bloodstream, and some can directly invade the deeper body tissues. The symptoms produced depend greatly on the type of microbe. Numerous organisms cause similar symptoms, especially diarrhea, abdominal cramps, and nausea. There is so much overlap that it is rarely possible to say which microbe is likely to be causing a given illness unless laboratory tests are done to identify the microbe, or unless the illness is part of a recognized outbreak.

How Are Foodborne Diseases Diagnosed?

The infection is usually diagnosed by specific laboratory tests that identify the causative organism. Bacteria such as Campylobacter, Salmonella, and E. coli O157 are found by culturing stool samples in the laboratory and identifying the bacteria that grow on the agar or other culture medium. Parasites can be identified by examining stools under the microscope. Viruses are more difficult to identify, as they are too small to see under a light microscope and are difficult to culture. Viruses are usually identified by testing stool samples for genetic markers that indicate a specific virus is present.

Many foodborne infections are not identified by routine laboratory procedures and require specialized, experimental, and/or expensive tests that are not generally available. If the diagnosis is to be made, the patient has to seek medical attention, the physician must decide to order diagnostic tests, and the laboratory must use the appropriate procedures. Because many ill persons to not seek attention, and of those that do, many are not tested, many cases of foodborne illness go undiagnosed. For example, CDC estimates that 38 cases of salmonellosis actually occur for every case that is actually diagnosed and reported to public health authorities.

How Are Foodborne Diseases Treated?

There are many different kinds of foodborne diseases and they may require different treatments, depending on the symptoms they cause. Illnesses that are primarily diarrhea or vomiting can lead to dehydration if the person loses more body fluids and salts (electrolytes) than they take in. Replacing the lost fluids and electrolytes and keeping up with fluid intake are important. If diarrhea is severe, oral rehydration solution such as Ceralyte*, Pedialyte* or Oralyte*, should be drunk to replace the fluid losses and prevent dehydration. Sports drinks such as Gatorade* do not replace the losses correctly and should not be used for the treatment of diarrheal illness. Preparations of bismuth subsalicylate (e.g., Pepto-Bismol*) can reduce the duration and severity of simple diarrhea. If diarrhea and cramps occur, without bloody stools or fever, taking an antidiarrheal medication may provide symptomatic relief, but these medications should be avoided if there is high fever or blood in the stools because they may make the illness worse.

* CDC does not endorse commercial products or services.

When Should I Consult My Doctor about a Diarrheal Illness?

A health care provider should be consulted for a diarrheal illness is accompanied by:

- High fever (temperature over 101.5 F, measured orally)
- Blood in the stools
- Prolonged vomiting that prevents keeping liquids down (which can lead to dehydration)
- Signs of dehydration, including a decrease in urination, a dry mouth and throat, and feeling dizzy when standing up.
- Diarrheal illness that lasts more than 3 days

Do not be surprised if your doctor does not prescribe an antibiotic. Many diarrheal illnesses are caused by viruses and will improve in 2 or 3 days without antibiotic therapy. In fact, antibiotics have no effect on viruses, and using an antibiotic to treat a viral infection could cause more harm than good It is often not necessary to take an antibiotic even in the case of a mild bacterial infection. Other treatments can help the symptoms, and careful hand washing can prevent the spread of infection to other people. Overuse of antibiotics is the principal reason many bacteria are becoming resistant. Resistant bacteria are no longer killed by the antibiotic. This means that it is important to use antibiotics only when they are really needed. Partial treatment can also cause bacteria to become resistant. If an antibiotic is prescribed, it is important to take all of the medication as prescribed, and not stop early just because the symptoms seem to be improving.

Cases of Foodborne Disease in the United States?

An estimated 76 million cases of foodborne disease occur each year in the United States. The great majority of these cases are mild and cause symptoms for only a day or two. Some cases are more serious, and CDC estimates that there are 325,000 hospitalizations and 5,000 deaths related to foodborne diseases each year. The most severe cases tend to occur in the very old, the very young, those who have an illness already that reduces their immune system function, and in healthy people exposed to a very high dose of an organism.

How Do Public Health Departments Track Foodborne Diseases?

Routine monitoring of important diseases by public health departments is called disease surveillance. Each state decides which diseases are to be under surveillance in that state. In most states, diagnosed cases of salmonellosis, E. coli O157:H7 and other serious infections are routinely reported to the health department. The county reports them to the state health department, which reports them to CDC. Tens of thousands of cases of these "notifiable conditions" are reported every year. For example, nearly 35,000 cases of Salmonella infection were reported to CDC in 1998. However, most foodborne infections go undiagnosed and unreported, either because the ill person does not see a doctor, or the doctor does not make a specific diagnosis. Also, infections with some microbes are not reportable in the first place.

To get more information about infections that might be diagnosed but not reported, CDC developed a special surveillance system called FoodNet. FoodNet provides the best available information about specific foodborne infections in the United States, and summarizes them in an annual report.

In addition to tracking the number of reported cases of individual infections, states also collect information about foodborne outbreaks, and report a summary of that information to CDC. About 400-500 foodborne outbreaks investigated by local and state health departments are reported each year. This includes information about many diseases that are not notifiable and thus are not under individual surveillance, so it provides some useful general information about foodborne diseases.

What Are Foodborne Disease Outbreaks and Why Do They Occur?

An outbreak of foodborne illness occurs when a group of people consume the same contaminated food and two or more of them come down with the same illness. It may be a group that ate a meal together somewhere, or it may be a group of people who do not know each other at all, but who all happened to buy and eat the same contaminated item from a grocery store or restaurant. For an outbreak to occur, something must have happened to contaminate a batch of food that was eaten by a group of people. Often, a combination of events contributes to the outbreak. A contaminated food may be left out a room temperature for many hours, allowing the bacteria to

multiply to high numbers, and then be insufficiently cooked to kill the bacteria.

Many outbreaks are local in nature. They are recognized when a group of people realize that they all became ill after a common meal, and someone calls the local health department. This classic local outbreak might follow a catered meal at a reception, a potluck supper, or eating a meal at an understaffed restaurant on a particularly busy day. However, outbreaks are increasingly being recognized that are more widespread, that affect persons in many different places, and that are spread out over several weeks. For example, a recent outbreak of salmonellosis was traced to persons eating a breakfast cereal produced at a factory in Minnesota, and marketed under several different brand names in many different states. No one county or state had very many cases and the cases did not know each other. The outbreaks was recognized because it was caused by an unusual strain of Salmonella, and because state public health laboratories that type Salmonella strains noticed a sudden increase in this one rare strain. In another recent outbreak, a particular peanut snack food caused the same illness in Israel, Europe and North America. Again, this was recognized as an increase in infections caused by a rare strain of Salmonella.

The vast majority of reported cases of foodborne illness are not part of recognized outbreaks, but occurs as individual or "sporadic" cases. It may be that many of these cases are actually part of unrecognized widespread or diffuse outbreaks. Detecting and investigating such widespread outbreaks is a major challenge to our public health system. This is the reason that new and more sophisticated laboratory methods are being used at CDC and in state public health department laboratories.

Why Do Public Health Officials Investigate Outbreaks?

A foodborne outbreak is an indication that something needs to be improved in our food safety system. Public health scientists investigate outbreaks to control them, and also to learn how similar outbreaks can be prevented in the future. Just as when a fire breaks out in a large building or when an airliner crashes, two activities are critical when an outbreak occurs. First, emergency action is needed to keep the immediate danger from spreading, and second, a detailed objective scientific investigation is needed to learn what went wrong, so that future similar events can be prevented. Much of what we know about foodborne disease and its prevention comes from detailed investigation of outbreaks. This is often how a new pathogen is

identified, and this is how the critical information linking a pathogen to a specific food and animal reservoir is first gathered. The full investigation can require a team with multiple talents, including the epidemiologist, microbiologist, food sanitarian, food scientist, veterinarian, and factory process engineer.

How Are Outbreaks of Foodborne Disease Detected?

The initial clue that an outbreak is occurring can come in various ways. It may be when a person realizes that several other people who were all together at an event have become ill and he or she calls the local health department. It may be when a physician realizes she has seen more than the usual number of patients with the same illness. It may be when a county health department gets an unusually large number of reports of illness. The hardest outbreaks to detect are those that are spread over a large geographic area, with only a few cases in each state. These outbreaks can be detected by combining surveillance reports at the regional or national level and looking for increases in infections of a specific type. This is why state public health laboratories determine the serotype of Salmonella bacteria isolated from people. New "DNA fingerprinting" technologies can make detecting outbreaks easier too. For example, the new molecular subtyping network, PulseNet, allows state laboratories and CDC to compare strains of E. coli O157:H7 and an increasing number of other pathogens from all across the United States to detect widespread outbreaks.

After an apparent cluster of cases is detected, it is important to determine whether these cases represent a real increase above the expected number of cases and whether they really might be related. Sometimes a cluster of reported cases is caused by something other than an actual outbreak of illness. For example, if the person responsible for reporting has just returned from a vacation and is clearing up a backlog of cases by reporting them all at once, the sudden surge of reports is just a false cluster.

How Is a Foodborne Disease Outbreak Investigated?

Once an outbreak is strongly suspected, an investigation begins. A search is made for more cases among persons who may have been exposed. The symptoms and time of onset, and location of possible cases is determined, and a "case definition" is developed that describes these typical cases. The outbreak is systematically described by time, place, and person. A graph is

drawn of the number of people who fell ill on each successive day to show pictorially when it occurred. A map of where the ill people live, work, or eat may be helpful to show where it occurred. Calculating the distribution of cases by age and sex shows who is affected. If the causative microbe is not known, samples of stool or blood are collected from ill people and sent to the public health laboratory to make the diagnosis.

To identify the food or other source of the outbreak, the investigators first interview a few persons with the most typical cases about exposures they may have had in the few days before they got sick. In this way, certain potential exposures may be excluded while others that are mentioned repeatedly emerge as possibilities. Combined with other information, such as the likely sources for the specific microbe involved, these hypotheses are then tested in a formal epidemiologic investigation. The investigators conduct systematic interviews about a list of possible exposures with the ill persons, and with a comparable group people who are not ill. By comparing how often an exposure is reported by ill people and by well people, investigators can measure the association of the exposure with illness. Using probability statistics, similar to those used to describe coin flips, the probability of no association is directly calculated.

For example, imagine that an outbreak has occurred after a catered event. Initial investigation suggested that Hollandaise sauce was eaten by at least some of the attendees, so it is on the list of possible hypotheses. Now, we interview 20 persons who attended the affair, 10 of whom became ill and 10 who remained well. Each ill or well person is interviewed about whether or not they ate the Hollandaise sauce, as well as various other food items. If half the people ate the sauce, but the sauce was not associated with the illness, then we would expect each person to have a 50/50 chance of reporting that they ate it, regardless of whether they were ill or not. Suppose, however, that we find that all 10 ill people but none of the well persons reported eating Hollandaise sauce at the event? This would be very unlikely to occur by chance alone if eating the Hollandaise sauce were not somehow related to the risk of illness. In fact, it would be about as unlikely as getting heads ten times in a row by flipping a coin (That is 50% multiplied by itself 10 times over, or a chance of just under 1 in 1000). So the epidemiologist concludes that eating the Hollandaise sauce was very likely to be associated with the risk of illness. Note that the investigator can draw this conclusion even though there is no Hollandaise sauce left to test in a laboratory. The association is even stronger if she can show that those who ate second helpings of Hollandaise were even more likely to become ill, or that persons who ate leftover Hollandaise sauce that went home in doggie bags also became ill.

Once a food item is statistically implicated in this manner, further investigation into its ingredients and preparation, and microbiologic culture of leftover ingredients or the food itself (if available) may provide additional information about the nature of contamination. Perhaps the Hollandaise sauce was made using raw eggs. The source of the raw eggs can be determined, and it may even be possible to trace them back to the farm and show that chickens on the farm are carrying the same strain of Salmonella in their ovaries. If so, the eggs from that farm can be pasteurized to prevent them from causing other outbreaks.

Some might think that the best investigation method would be just to culture all the leftover foods in the kitchen, and conclude that the one that is positive is the one that caused the outbreak. The trouble is that this can be misleading, because it happens after the fact. What if the Hollandaise sauce is all gone, but the spoon that was in the sauce got placed in potato salad that was not served at the function? Now, cultures of the potato salad yield a pathogen, and the unwary tester might call that the source of the outbreak, even though the potato salad had nothing to do with it. This means that laboratory testing without epidemiologic investigation can lead to the wrong conclusion.

Even without isolating microbes from food, a well-conducted epidemiologic investigation can guide immediate efforts to control the outbreak. A strong and consistent statistical association between illness and a particular food item that explains the distribution of the outbreak in time, place and person should be acted upon immediately to stop further illness from occurring.

An outbreak ends when the critical exposure stops. This may happen because all the contaminated food is eaten or recalled, because a restaurant is closed or a food processor shuts down or changes its procedures, or an infected food handler is no longer infectious or is no longer working with food. An investigation that clarifies the nature and mechanism of contamination can provide critical information even if the outbreak is over. Understanding the contamination event well enough to prevent it can guide the decision to resume usual operations, and lead to more general prevention measures that reduce the risk of similar outbreaks happening elsewhere.

How Does Food Become Contaminated?

We live in a microbial world, and there are many opportunities for food to become contaminated as it is produced and prepared. Many foodborne microbes are present in healthy animals (usually in their intestines) raised for food. Meat and poultry carcasses can become contaminated during slaughter by contact with small amounts of intestinal contents. Similarly, fresh fruits and vegetables can be contaminated if they are washed or irrigated with water that is contaminated with animal manure or human sewage. Some types of Salmonella can infect a hen's ovary so that the internal contents of a normal looking egg can be contaminated with Salmonella even before the shell in formed. Oysters and other filter feeding shellfish can concentrate Vibrio bacteria that are naturally present in sea water, or other microbes that are present in human sewage dumped into the sea.

Later in food processing, other foodborne microbes can be introduced from infected humans who handle the food, or by cross contamination from some other raw agricultural product. For example, Shigella bacteria, hepatitis A virus and Norwalk virus can be introduced by the unwashed hands of food handlers who are themselves infected. In the kitchen, microbes can be transferred from one food to another food by using the same knife, cutting board or other utensil to prepare both without washing the surface or utensil in between. A food that is fully cooked can become recontaminated if it touches other raw foods or drippings from raw foods that contain pathogens.

The way that food is handled after it is contaminated can also make a difference in whether or not an outbreak occurs. Many bacterial microbes need to multiply to a larger number before enough are present in food to cause disease. Given warm moist conditions and an ample supply of nutrients, one bacterium that reproduces by dividing itself every half hour can produce 16 billion progeny in 12 hours. As a result, lightly contaminated food left out overnight can be highly infectious by the next day. If the food were refrigerated promptly, the bacteria would not multiply at all. In general, refrigeration or freezing prevents virtually all bacteria from growing but generally preserves them in a state of suspended animation. This general rule has a few surprising exceptions. Two foodborne bacteria, Listeria monocytogenes and Yersinia enterocolitica can actually grow at refrigerator temperatures. High salt, high sugar or high acid levels keep bacteria from growing, which is why salted meats, jam, and pickled vegetables are traditional preserved foods.

Microbes are killed by heat. If food is heated to an internal temperature above 160°F, or 78°C, for even a few seconds this sufficient to kill parasites, viruses or bacteria, except for the Clostridium bacteria, which produce a heat-resistant form called a spore. Clostridium spores are killed only at temperatures above boiling. This is why canned foods must be cooked to a high temperature under pressure as part of the canning process.

The toxins produced by bacteria vary in their sensitivity to heat. The staphylococcal toxin which causes vomiting is not inactivated even if it is boiled. Fortunately, the potent toxin that causes botulism is completely inactivated by boiling.

What Foods Are Most Associated with Foodborne Illness?

Raw foods of animal origin are the most likely to be contaminated; that is, raw meat and poultry, raw eggs, unpasteurized milk, and raw shellfish. Because filter-feeding shellfish strain microbes from the sea over many months, they are particularly likely to be contaminated if there are any pathogens in the seawater. Foods that mingle the products of many individual animals, such as bulk raw milk, pooled raw eggs, or ground beef, are particularly hazardous because a pathogen present in any one of the animals may contaminate the whole batch. A single hamburger may contain meat from hundreds of animals. A single restaurant omelet may contain eggs from hundreds of chickens. A glass of raw milk may contain milk from hundreds of cows. A broiler chicken carcass can be exposed to the drippings and juices of many thousands of other birds that went through the same cold water tank after slaughter.

Fruits and vegetables consumed raw are a particular concern. Washing can decrease but not eliminate contamination, so the consumers can do little to protect themselves. Recently, a number of outbreak have been traced to fresh fruits and vegetables that were processed under less than sanitary conditions. These outbreaks show that the quality of the water used for washing and chilling the produce after it is harvested is critical. Using water that is not clean can contaminate many boxes of produce. Fresh manure used to fertilize vegetables can also contaminate them. Alfalfa sprouts and other raw sprouts pose a particular challenge, as the conditions under which they are sprouted are ideal for growing microbes as well as sprouts, and because they are eaten without further cooking. That means that a few bacteria present on the seeds can grow to high numbers of pathogens on the sprouts.

Unpasteurized fruit juice can also be contaminated if there are pathogens in or on the fruit that is used to make it.

What Can Consumers Do to Protect Themselves from Foodborne Illness?

A few simple precautions can reduce the risk of foodborne diseases:

- Cook meat, poultry and eggs thoroughly. Using a thermometer to measure the internal temperature of meat is a good way to be sure that it is cooked sufficiently to kill bacteria. For example, ground beef should be cooked to an internal temperature of 160°F. Eggs should be cooked until the yolk is firm.
- Separate. Don't cross-contaminate one food with another. Avoid cross-contaminating foods by washing hands, utensils, and cutting boards after they have been in contact with raw meat or poultry and before they touch another food. Put cooked meat on a clean platter, rather back on one that held the raw meat.
- Chill. Refrigerate leftovers promptly. Bacteria can grow quickly at room temperature, so refrigerate leftover foods if they are not going to be eaten within 4 hours. Large volumes of food will cool more quickly if they are divided into several shallow containers for refrigeration.
- Clean. Wash produce. Rinse fresh fruits and vegetables in running tap water to remove visible dirt and grime. Remove and discard the outermost leaves of a head of lettuce or cabbage. Because bacteria can grow well on the cut surface of fruit or vegetable, be careful not to contaminate these foods while slicing them up on the cutting board, and avoid leaving cut produce at room temperature for many hours. Don't be a source of foodborne illness yourself. Wash your hands with soap and water before preparing food. Avoid preparing food for others if you yourself have a diarrheal illness. Changing a baby's diaper while preparing food is a bad idea that can easily spread illness.
- Report suspected foodborne illnesses to your local health department. The local public health department is an important part of the food safety system. Often calls from concerned citizens are how outbreaks are first detected. If a public health official contacts you to find our more about an illness you had, your cooperation is important. In public health investigations, it can be as important to talk to healthy people as to ill people. Your cooperation may be needed even if you are not ill.

High Risk Populations

Some persons at particularly high risk should take more precautions.

Pregnant women, the elderly, and those weakened immune systems are at higher risk for severe infections such as Listeria and should be particularly careful not to consume undercooked animal products. They should avoid soft French style cheeses, pates, uncooked hot dogs and sliced deli meats, which have been sources of Listeria infections. Persons at high risk should also avoid alfalfa sprouts and unpasteurized juices.

A bottle-fed infant is at higher risk for severe infections with Salmonella or other bacteria that can grow in a bottle of warm formula if it is left at room temperature for many hours. Particular care is needed to be sure the baby's bottle is cleaned and disinfected and that leftover milk formula or juice is not held in the bottle for many hours.

Persons with liver disease are susceptible to infections with a rare but dangerous microbe called Vibrio vulnificus, found in oysters. They should avoid eating raw oysters.

Protect Yourself When Eating in Restaurants

You can protect yourself first by choosing which restaurant to patronize. Restaurants are inspected by the local health department to make sure they are clean and have adequate kitchen facilities. Find out how restaurants did on their most recent inspections, and use that score to help guide your choice. In many jurisdictions, the latest inspection score is posted in the restaurant. Some restaurants have specifically trained their staff in principles of food safety. This is also good to know in deciding which restaurant to patronize.

You can also protect yourself from foodborne disease when ordering specific foods, just as you would at home. When ordering a hamburger, ask for it to be cooked to a temperature of 160^{o}F and send it back if it is still pink in the middle. Before you order something that is made with many eggs pooled together, such as scrambled eggs, omelets or French toast, ask the waiter whether it was made with pasteurized egg, and choose something else if it was not.

How Can Food Be Made Safer?

Making food safe in the first place is a major effort, involving the farm and fishery, the production plant or factory, and many other points from the farm to the table. Many different groups in public health, industry, regulatory agencies, and academia have roles to play in making the food supply less contaminated. Consumers can promote general food safety with their dollars, by purchasing foods that have been processed for safety. For example, milk pasteurization was a major advance in food safety that was developed 100 years ago. Buying pasteurized milk rather than raw unpasteurized milk still prevents an enormous number of foodborne diseases every day. Now juice pasteurization is a recent important step forward that prevents E. coli O157:H7 infections and many other diseases. Consumers can look for and buy pasteurized fruit juices and ciders. In the future, meat and other foods will be available that has been treated for safety with irradiation. These new technologies are likely to be as important a step forward as the pasteurization of milk.

Foodborne diseases are largely preventable, though there is no simple one-step prevention measure like a vaccine. Instead, measures are needed to prevent or limit contamination all the way from farm to table. A variety of good agricultural and manufacturing practices can reduce the spread of microbes among animals and prevent the contamination of foods. Careful review of the whole food production process can identify the principal hazards, and the control points where contamination can be prevented, limited, or eliminated. A formal method for evaluating the control of risk in foods exists is called the Hazard Analysis Critical Control Point, or HACCP system. This was first developed by NASA to make sure that the food eaten by astronauts was safe. HACCP safety principles are now being applied to an increasing spectrum of foods, including meat, poultry, and seafood.

For some particularly risky foods, even the most careful hygiene and sanitation are insufficient to prevent contamination, and a definitive microbe-killing step must be included in the process. For example, early in the century, large botulism outbreaks occurred when canned foods were cooked insufficiently to kill the botulism spores. After research was done to find out exactly how much heat was needed to kill the spores, the canning industry and the government regulators went to great lengths to be sure every can was sufficiently cooked. As a result, botulism related to commercial canned foods has disappeared in this country. Similarly the introduction of careful pasteurization of milk eliminated a large number of milk-borne diseases. This occurred after sanitation in dairies had already reached a high level. In the future, other foods can be made much safer by

new pasteurizing technologies, such as in-shell pasteurization of eggs, and irradiation of ground beef. Just as with milk, these new technologies should be implemented in addition to good sanitation, not as a replacement for it.

In the end, it is up to the consumer to demand a safe food supply; up to industry to produce it; up to researchers to develop better ways of doing so; and up to government to see that it happens, to make sure it works and to identify problems still in need of solutions.

What Is CDC Doing to Control and Prevent Foodborne Disease?

CDC is part of the U. S. Public Health Service, with a mission to use the best scientific information to monitor, investigate, control and prevent public health problems. Using the tools of epidemiology and laboratory science, CDC provides scientific assessment of public health threats. CDC works closely with State health departments to monitor the frequency of specific diseases and conducts national surveillance for them. CDC provides expert epidemiologic and microbiologic consultation to health departments and other federal agencies on a variety of public health issues, including foodborne disease, and it stations epidemiologists in state health departments to help with the surveillance and investigation of many problems. CDC can also send a team into the field to conduct emergency field investigations of large or unusual outbreaks, in collaboration with state public health officials. CDC researchers develop new methods for identifying, characterizing and fingerprinting the microbes that cause disease. We translate laboratory research into practical field methods that can be used by public health authorities in States and counties.

CDC is not a regulatory agency. Government regulation of food safety is carried out by the Food and Drug Administration (FDA) (**http://www.fda.gov/**), the U.S. Department of Agriculture ((USDA, **http://www.usda.gov/**), the National Marine Fisheries Service (**http://ceres.ca.gov/wetlands/agencies/nmfs.html**), and other regulatory agencies. CDC maintains regular contact with the regulatory agencies.
When new public health threats appear, CDC learns what they are and how they can be controlled through rapid scientific field and laboratory investigation. CDC shares the results of these investigations with the states, with the regulatory federal agencies and with the industries themselves. Although we do not regulate the safety of food, CDC assesses the effectiveness of current prevention efforts. We provide independent

scientific assessment of what the problems are, how they can be controlled, and of where there are gaps in our knowledge.

What Are Some Unsolved Problems in Foodborne Disease?

As new foodborne problems emerge, several questions need to be answered before the problem can be successfully controlled. It takes careful scientific observation and research to answer these questions. Some pressing unanswered questions include:

- How do the foodborne pathogens spread among the animals themselves, and how can this be prevented? This includes E. coli O157:H7 among cattle, Salmonella Enteritis among egg-laying hens, and Campylobacter in broiler chickens. If we could prevent the animals from becoming infected in the first place, we would not have as much illness in the humans who eat them.
- What is the microbial cause of outbreaks in which no pathogen can be identified by current methods? This is true for over half of the reported foodborne outbreaks. Will wider application of existing experimental diagnostic methods help, or are these outbreaks caused by pathogens we simply do not yet know how to identify?
- What would be the impact of basic food safety education of restaurant workers on the risk of foodborne disease among restaurant patrons?
- How can the food and water that animals consume be made safer?
- How can we dispose of animal manure usefully, without threatening the food supply and the environment?
- How can basic food safety principles be most effectively taught to school children?
- How can we be sure food safety standards in other countries are as good as those in the United States? As we import more of our fresh foods from other countries, we need to be confident that they are produced with the same level of safety as food in the United States.
- What control strategies in the slaughter plant will reduce the contamination of poultry meat with Campylobacter?
- How can irradiation pasteurization of certain high risk foods, such as ground beef, be used most effectively?
- How do raspberries in Central America get contaminated with Cyclospora in the first place? Does this parasite have an animal reservoir?

- How can alfalfa sprouts and other raw sprouts be produced safely? Sprouts are unique among foods in that the conditions for sprouting are also perfect for bacterial growth, and they are not cooked after that.

Where Can I Learn More about Food Safety and Foodborne Diseases?

For more information, contact:

- National Food Safety Initiative: **http://www.foodsafety.gov/~dms/fs-toc.html**
- CDC's Food Safety Initiative home page: **http://www.cdc.gov/ncidod/dbmd/fsia/default.htm**
- U.S. Food and Drug Administration: **http://www.fda.gov/**
- U.S. Food Safety and Inspection Service (FSIS): **http://www.fsis.usda.gov/**
- U.S. Environmental Protection Agency: **http://www.epa.gov/**
- Role of the federal agencies in food safety: **http://vm.cfsan.fda.gov/~lrd/foodteam.html**
- Gateway to government food safety information: **http://www.foodsafety.gov/**
- Partnership for Food Safety Education/Fight BAC!™: **http://www.fightbac.org/**
- Food Safety Training and Education Alliance: **http://www.foodsafety.gov/~fsg/fstea.html**
- Foodborne Illness Information Center: **http://www.nal.usda.gov/fnic/foodborne/wais.shtml**
- National Food Safety Education Month: **http://www.foodsafety.gov/~fsg/september.html**
- Travelers' Health: **http://www.cdc.gov/travel/**

Foodborne Diseases: Technical Notes

The Division of Bacterial and Mycotic Diseases of the CDC publishes summary information on foodborne diseases for use by healthcare professionals and physicians. The information is presented in the form of notes. The notes are written in a rather technical language. A few medical

expressions are particularly noteworthy. "Clinical features" generally cover the signs and symptoms of foodborne diseases that can help the doctor with diagnosis. It may also include a discussion of the cause or "etiology" of foodborne diseases. "Etiologic agent" signifies the particular organism, typically written in Latin, which causes or is associated with foodborne diseases. "Reservoir" indicates the habitat or living environment of the organism. "Incidence" describes the number of people that are diagnosed with foodborne diseases within a given population. "Sequelae" includes any related health consequences or secondary pathological conditions and diseases that may result from foodborne diseases. "Transmission" describes how a disease spreads. "Risk Groups" are people who are most likely to be diagnosed with foodborne diseases. "Surveillance" describes how foodborne diseases is monitored by government officials across the population. "Challenges" and "Opportunities" are issues or areas where officials think progress might be made in understanding or combating foodborne diseases in the future. The notes that follow were recently published by the CDC.[57]

Clinical Features

More than 250 foodborne diseases have been described. Symptoms vary widely depending on etiologic agent. Diarrhea and vomiting are the most common.

Etiologic Agent

Many different bacteria (e.g., Campylobacter, Salmonella, E. coli O157:H7), viruses (e.g., caliciviruses), and parasites (e.g., Giardia, Cyclospora), and natural and manmade chemicals (e.g., mushroom toxins and heavy metals).

Incidence

Estimated to cause 76 million illnesses, 325,000 hospitalizations, and 5,200 deaths in the United States each year. Known pathogens account for an estimated 14 million illnesses, 60,000 hospitalizations, and 1,800 deaths annually.

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[57] Adapted from The Centers for Disease Control and Prevention (CDC): **http://www.cdc.gov/ncidod/dbmd/diseaseinfo/foodborneinfections_t.htm**.

Sequelae

Septicemia, abortion, localized infections, arthritis, hemolytic uremic syndrome, Guillain-Barré syndrome, death.

Costs

Unknown. Medical costs and lost wages due to foodborne salmonellosis, only 1 of many foodborne infections, have been estimated to be more than $1 billion/year.

Transmission

Ingestion of contaminated food, with or without subsequent spread from person to person by the fecal-oral route.

Risk Groups

All persons. Infants, elderly, and the immunocompromised at greatest risk of serious illness and death.

Surveillance

Laboratory-based surveillance for some foodborne pathogens (e.g., Salmonella, E. coli O157:H7, Campylobacter) – nationwide. Active, population-based surveillance (FoodNet) – detailed information for selected sites in the United States.

Foodborne Disease Outbreak Surveillance System-- information on outbreaks only, passive, insensitive, and delayed.

Trends

New pathogens continue to emerge (e.g., Salmonella Typhimurium DT104, Salmonella Enteritidis phage type 4); older conditions re-emerging (e.g., salmonellosis from pet reptiles).

Overall incidence of reported outbreaks has not changed, but proportion caused by fruits and vegetables has been increasing. Resistance of foodborne pathogens to antimicrobial agents is increasing.

Challenges

Identify new foodborne pathogens. Define points of effective intervention. Implement and evaluate control strategies.

Opportunities

Identification of control points provides opportunity to directly intervene in the transmission of specific foodborne pathogens.

ONLINE GLOSSARIES

The Internet provides access to a number of free-to-use medical dictionaries and glossaries. The National Library of Medicine has compiled the following list of online dictionaries:

- ADAM Medical Encyclopedia (A.D.A.M., Inc.), comprehensive medical reference: **http://www.nlm.nih.gov/medlineplus/encyclopedia.html**
- MedicineNet.com Medical Dictionary (MedicineNet, Inc.): **http://www.medterms.com/Script/Main/hp.asp**
- Merriam-Webster Medical Dictionary (Inteli-Health, Inc.): **http://www.intelihealth.com/IH/**
- Multilingual Glossary of Technical and Popular Medical Terms in Eight European Languages (European Commission) - Danish, Dutch, English, French, German, Italian, Portuguese, and Spanish: **http://allserv.rug.ac.be/~rvdstich/eugloss/welcome.html**
- On-line Medical Dictionary (CancerWEB): **http://www.graylab.ac.uk/omd/**
- Technology Glossary (National Library of Medicine) - Health Care Technology: **http://www.nlm.nih.gov/nichsr/ta101/ta10108.htm**
- Terms and Definitions (Office of Rare Diseases): **http://rarediseases.info.nih.gov/ord/glossary_a-e.html**

Beyond these, MEDLINEplus contains a very user-friendly encyclopedia covering every aspect of medicine (licensed from A.D.A.M., Inc.). The ADAM Medical Encyclopedia Web site address is **http://www.nlm.nih.gov/medlineplus/encyclopedia.html**. ADAM is also available on commercial Web sites such as Web MD (**http://my.webmd.com/adam/asset/adam_disease_articles/a_to_z/a)** and drkoop.com (**http://www.drkoop.com/**). Topics of interest can be researched by using keywords before continuing elsewhere, as these basic definitions and concepts will be useful in more advanced areas of research. You may choose to print various pages specifically relating to Vibrio vulnificus infection and keep them on file.

Online Dictionary Directories

The following are additional online directories compiled by the National Library of Medicine, including a number of specialized medical dictionaries and glossaries:

- Medical Dictionaries: Medical & Biological (World Health Organization): **http://www.who.int/hlt/virtuallibrary/English/diction.htm#Medical**
- MEL-Michigan Electronic Library List of Online Health and Medical Dictionaries (Michigan Electronic Library): **http://mel.lib.mi.us/health/health-dictionaries.html**
- Patient Education: Glossaries (DMOZ Open Directory Project): **http://dmoz.org/Health/Education/Patient_Education/Glossaries/**
- Web of Online Dictionaries (Bucknell University): **http://www.yourdictionary.com/diction5.html#medicine**

VIBRIO VULNIFICUS INFECTION GLOSSARY

The following is a complete glossary of terms used in this sourcebook. The definitions are derived from official public sources including the National Institutes of Health [NIH] and the European Union [EU]. After this glossary, we list a number of additional hardbound and electronic glossaries and dictionaries that you may wish to consult.

Abortion: 1. the premature expulsion from the uterus of the products of conception - of the embryo, or of a nonviable fetus. The four classic symptoms, usually present in each type of abortion, are uterine contractions, uterine haemorrhage, softening and dilatation of the cervix, and presentation or expulsion of all or part of the products of conception. 2. premature stoppage of a natural or a pathological process. [EU]

Acetaminophen: Analgesic antipyretic derivative of acetanilide. It has weak anti-inflammatory properties and is used as a common analgesic, but may cause liver, blood cell, and kidney damage. [NIH]

Aeromonas: A genus of gram-negative, facultatively anaerobic, rod-shaped bacteria that occurs singly, in pairs, or in short chains. Its organisms are found in fresh water and sewage and are pathogenic to humans, frogs, and fish. [NIH]

Agar: A complex sulfated polymer of galactose units, extracted from Gelidium cartilagineum, Gracilaria confervoides, and related red algae. It is used as a gel in the preparation of solid culture media for microorganisms, as a bulk laxative, in making emulsions, and as a supporting medium for immunodiffusion and immunoelectrophoresis. [NIH]

Anemia: A reduction in the number of circulating erythrocytes or in the quantity of hemoglobin. [NIH]

Antibiotic: A chemical substance produced by a microorganism which has the capacity, in dilute solutions, to inhibit the growth of or to kill other microorganisms. Antibiotics that are sufficiently nontoxic to the host are used as chemotherapeutic agents in the treatment of infectious diseases of man, animals and plants. [EU]

Antimicrobial: Killing microorganisms, or suppressing their multiplication or growth. [EU]

Assay: Determination of the amount of a particular constituent of a mixture, or of the biological or pharmacological potency of a drug. [EU]

Bacterial Infections: Infections by bacteria, general or unspecified. [NIH]

Bacteriophages: Viruses whose host is a bacterial cell. [NIH]

Bismuth: A metallic element that has the atomic symbol Bi, atomic number 83 and atomic weight 208.98. [NIH]

Blastomycosis: A fungal infection that may appear in two forms: 1) a primary lesion characterized by the formation of a small cutaneous nodule and small nodules along the lymphatics that may heal within several months; and 2) chronic granulomatous lesions characterized by thick crusts, warty growths, and unusual vascularity and infection in the middle or upper lobes of the lung. [NIH]

Campylobacter: A genus of bacteria found in the reproductive organs, intestinal tract, and oral cavity of animals and man. Some species are pathogenic. [NIH]

Candidiasis: Infection with a fungus of the genus Candida. It is usually a superficial infection of the moist cutaneous areas of the body, and is generally caused by C. albicans; it most commonly involves the skin (dermatocandidiasis), oral mucous membranes (thrush, def. 1), respiratory tract (bronchocandidiasis), and vagina (vaginitis). Rarely there is a systemic infection or endocarditis. Called also moniliasis, candidosis, oidiomycosis, and formerly blastodendriosis. [EU]

Capsules: Hard or soft soluble containers used for the oral administration of medicine. [NIH]

Carbohydrate: An aldehyde or ketone derivative of a polyhydric alcohol, particularly of the pentahydric and hexahydric alcohols. They are so named because the hydrogen and oxygen are usually in the proportion to form water, (CH2O)n. The most important carbohydrates are the starches, sugars, celluloses, and gums. They are classified into mono-, di-, tri-, poly- and heterosaccharides. [EU]

Ceftazidime: Semisynthetic, broad-spectrum antibacterial derived from cephaloridine and used especially for Pseudomonas and other gram-negative infections in debilitated patients. [NIH]

Cholera: An acute diarrheal disease endemic in India and Southeast Asia whose causative agent is vibrio cholerae. This condition can lead to severe dehydration in a matter of hours unless quickly treated. [NIH]

Cholesterol: The principal sterol of all higher animals, distributed in body tissues, especially the brain and spinal cord, and in animal fats and oils. [NIH]

Chronic: Persisting over a long period of time. [EU]

Cirrhosis: Liver disease characterized pathologically by loss of the normal microscopic lobular architecture, with fibrosis and nodular regeneration. The term is sometimes used to refer to chronic interstitial inflammation of any organ. [EU]

Clostridium: A genus of motile or nonmotile gram-positive bacteria of the

family bacillaceae. Many species have been identified with some being pathogenic. They occur in water, soil, and in the intestinal tract of humans and lower animals. [NIH]

Contamination: The soiling or pollution by inferior material, as by the introduction of organisms into a wound, or sewage into a stream. [EU]

Cryptosporidiosis: Parasitic intestinal infection with severe diarrhea caused by a protozoan, cryptosporidium. It occurs in both animals and humans. [NIH]

Cryptosporidium: A genus of coccidian parasites of the family cryptosporidiidae, found in the intestinal epithelium of many vertebrates including humans. [NIH]

Cutaneous: Pertaining to the skin; dermal; dermic. [EU]

Cyclospora: A genus of coccidian parasites in the family eimeriidae. Cyclospora cayetanensis is pathogenic in humans, probably transmitted via the fecal-oral route, and causes nausea and diarrhea. [NIH]

Degenerative: Undergoing degeneration : tending to degenerate; having the character of or involving degeneration; causing or tending to cause degeneration. [EU]

Dehydration: The condition that results from excessive loss of body water. Called also anhydration, deaquation and hypohydration. [EU]

Diarrhea: Passage of excessively liquid or excessively frequent stools. [NIH]

Disinfection: Rendering pathogens harmless through the use of heat, antiseptics, antibacterial agents, etc. [NIH]

Doxycycline: A synthetic tetracycline derivative with a range of antimicrobial activity and mode of action similar to that of tetracycline, but more effective against many species. Animal studies suggest that it may cause less tooth staining than other tetracyclines. [NIH]

Electrolyte: A substance that dissociates into ions when fused or in solution, and thus becomes capable of conducting electricity; an ionic solute. [EU]

Endocarditis: Exudative and proliferative inflammatory alterations of the endocardium, characterized by the presence of vegetations on the surface of the endocardium or in the endocardium itself, and most commonly involving a heart valve, but sometimes affecting the inner lining of the cardiac chambers or the endocardium elsewhere. It may occur as a primary disorder or as a complication of or in association with another disease. [EU]

Enterocolitis: Inflammation involving both the small intestine and the colon; see also enteritis. [EU]

Erythema: A name applied to redness of the skin produced by congestion of the capillaries, which may result from a variety of causes, the etiology or a specific type of lesion often being indicated by a modifying term. [EU]

Escherichia: A genus of gram-negative, facultatively anaerobic, rod-shaped bacteria whose organisms occur in the lower part of the intestine of warm-blooded animals. The species are either nonpathogenic or opportunistic pathogens. [NIH]

Extracellular: Outside a cell or cells. [EU]

Fatigue: The state of weariness following a period of exertion, mental or physical, characterized by a decreased capacity for work and reduced efficiency to respond to stimuli. [NIH]

Feces: The excrement discharged from the intestines, consisting of bacteria, cells exfoliated from the intestines, secretions, chiefly of the liver, and a small amount of food residue. [EU]

Gastroenteritis: An acute inflammation of the lining of the stomach and intestines, characterized by anorexia, nausea, diarrhoea, abdominal pain, and weakness, which has various causes, including food poisoning due to infection with such organisms as Escherichia coli, Staphylococcus aureus, and Salmonella species; consumption of irritating food or drink; or psychological factors such as anger, stress, and fear. Called also enterogastritis. [EU]

Gastrointestinal: Pertaining to or communicating with the stomach and intestine, as a gastrointestinal fistula. [EU]

Giardiasis: An infection of the small intestine caused by the flagellated protozoan giardia lamblia. It is spread via contaminated food and water and by direct person-to-person contact. [NIH]

Hemolysis: The destruction of erythrocytes by many different causal agents such as antibodies, bacteria, chemicals, temperature, and changes in tonicity. [NIH]

Hepatitis: Inflammation of the liver. [EU]

Hybridization: The genetic process of crossbreeding to produce a hybrid. Hybrid nucleic acids can be formed by nucleic acid hybridization of DNA and RNA molecules. Protein hybridization allows for hybrid proteins to be formed from polypeptide chains. [NIH]

Hypotension: Abnormally low blood pressure; seen in shock but not necessarily indicative of it. [EU]

Hypotensive: Characterized by or causing diminished tension or pressure, as abnormally low blood pressure. [EU]

Immunity: The condition of being immune; the protection against infectious disease conferred either by the immune response generated by immunization or previous infection or by other nonimmunologic factors (innate i.). [EU]

Incubation: The development of an infectious disease from the entrance of

the pathogen to the appearance of clinical symptoms. [EU]

Ingestion: The act of taking food, medicines, etc., into the body, by mouth. [EU]

Intestines: The section of the alimentary canal from the stomach to the anus. It includes the large intestine and small intestine. [NIH]

Iodine: A nonmetallic element of the halogen group that is represented by the atomic symbol I, atomic number 53, and atomic weight of 126.90. It is a nutritionally essential element, especially important in thyroid hormone synthesis. In solution, it has anti-infective properties and is used topically. [NIH]

Leprosy: A chronic granulomatous infection caused by mycobacterium leprae. The granulomatous lesions are manifested in the skin, the mucous membranes, and the peripheral nerves. Two polar or principal types are lepromatous and tuberculoid. [NIH]

Lesion: Any pathological or traumatic discontinuity of tissue or loss of function of a part. [EU]

Listeria: A genus of bacteria which may be found in the feces of animals and man, on vegetation, and in silage. Its species are parasitic on cold-blooded and warm-blooded animals, including man. [NIH]

Membrane: A thin layer of tissue which covers a surface, lines a cavity or divides a space or organ. [EU]

Microbiological: Pertaining to microbiology : the science that deals with microorganisms, including algae, bacteria, fungi, protozoa and viruses. [EU]

Microbiology: The study of microorganisms such as fungi, bacteria, algae, archaea, and viruses. [NIH]

Microorganism: A microscopic organism; those of medical interest include bacteria, viruses, fungi and protozoa. [EU]

Microscopy: The application of microscope magnification to the study of materials that cannot be properly seen by the unaided eye. [NIH]

Microsporidiosis: Infections with protozoa of the phylum microspora. [NIH]

Mononucleosis: The presence of an abnormally large number of mononuclear leucocytes (monocytes) in the blood. The term is often used alone to refer to infectious mononucleosis. [EU]

Mycotic: Pertaining to a mycosis; caused by fungi. [EU]

Nausea: An unpleasant sensation, vaguely referred to the epigastrium and abdomen, and often culminating in vomiting. [EU]

Necrosis: The sum of the morphological changes indicative of cell death and caused by the progressive degradative action of enzymes; it may affect groups of cells or part of a structure or an organ. [EU]

Neural: 1. pertaining to a nerve or to the nerves. 2. situated in the region of the spinal axis, as the neutral arch. [EU]

Niacin: Water-soluble vitamin of the B complex occurring in various animal and plant tissues. Required by the body for the formation of coenzymes NAD and NADP. Has pellagra-curative, vasodilating, and antilipemic properties. [NIH]

Oral: Pertaining to the mouth, taken through or applied in the mouth, as an oral medication or an oral thermometer. [EU]

Ovary: Either of the paired glands in the female that produce the female germ cells and secrete some of the female sex hormones. [NIH]

Overdose: 1. to administer an excessive dose. 2. an excessive dose. [EU]

Parvovirus: A genus of the family parvoviridae, subfamily parvovirinae, infecting a variety of vertebrates including humans. Parvoviruses are responsible for a number of important diseases but also can be non-pathogenic in certain hosts. The type species is mice minute virus. [NIH]

Phagocytosis: Endocytosis of particulate material, such as microorganisms or cell fragments. The material is taken into the cell in membrane-bound vesicles (phagosomes) that originate as pinched off invaginations of the plasma membrane. Phagosomes fuse with lysosomes, forming phagolysosomes in which the engulfed material is killed and digested. [EU]

Potassium: An element that is in the alkali group of metals. It has an atomic symbol K, atomic number 19, and atomic weight 39.10. It is the chief cation in the intracellular fluid of muscle and other cells. Potassium ion is a strong electrolyte and it plays a significant role in the regulation of fluid volume and maintenance of the water-electrolyte balance. [NIH]

Proteins: Polymers of amino acids linked by peptide bonds. The specific sequence of amino acids determines the shape and function of the protein. [NIH]

Proteolytic: 1. pertaining to, characterized by, or promoting proteolysis. 2. an enzyme that promotes proteolysis (= the splitting of proteins by hydrolysis of the peptide bonds with formation of smaller polypeptides). [EU]

Receptor: 1. a molecular structure within a cell or on the surface characterized by (1) selective binding of a specific substance and (2) a specific physiologic effect that accompanies the binding, e.g., cell-surface receptors for peptide hormones, neurotransmitters, antigens, complement fragments, and immunoglobulins and cytoplasmic receptors for steroid hormones. 2. a sensory nerve terminal that responds to stimuli of various kinds. [EU]

Rehydration: The restoration of water or of fluid content to a body or to substance which has become dehydrated. [EU]

Riboflavin: Nutritional factor found in milk, eggs, malted barley, liver, kidney, heart, and leafy vegetables. The richest natural source is yeast. It occurs in the free form only in the retina of the eye, in whey, and in urine; its principal forms in tissues and cells are as FMN and FAD. [NIH]

Rubella: An acute, usually benign, infectious disease caused by a togavirus and most often affecting children and nonimmune young adults, in which the virus enters the respiratory tract via droplet nuclei and spreads to the lymphatic system. It is characterized by a slight cold, sore throat, and fever, followed by enlargement of the postauricular, suboccipital, and cervical lymph nodes, and the appearances of a fine pink rash that begins on the head and spreads to become generalized. Called also German measles, roetln, röteln, and three-day measles, and rubeola in French and Spanish. [EU]

Salmonella: A genus of gram-negative, facultatively anaerobic, rod-shaped bacteria that utilizes citrate as a sole carbon source. It is pathogenic for humans, causing enteric fevers, gastroenteritis, and bacteremia. Food poisoning is the most common clinical manifestation. Organisms within this genus are separated on the basis of antigenic characteristics, sugar fermentation patterns, and bacteriophage susceptibility. [NIH]

Sanitation: The development and establishment of environmental conditions favorable to the health of the public. [NIH]

Sediment: A precipitate, especially one that is formed spontaneously. [EU]

Selenium: An element with the atomic symbol Se, atomic number 34, and atomic weight 78.96. It is an essential micronutrient for mammals and other animals but is toxic in large amounts. Selenium protects intracellular structures against oxidative damage. It is an essential component of glutathione peroxidase. [NIH]

Septic: Produced by or due to decomposition by microorganisms; putrefactive. [EU]

Septicemia: Systemic disease associated with the presence and persistence of pathogenic microorganisms or their toxins in the blood. Called also blood poisoning. [EU]

Species: A taxonomic category subordinate to a genus (or subgenus) and superior to a subspecies or variety, composed of individuals possessing common characters distinguishing them from other categories of individuals of the same taxonomic level. In taxonomic nomenclature, species are designated by the genus name followed by a Latin or Latinized adjective or noun. [EU]

Spectrum: A charted band of wavelengths of electromagnetic vibrations obtained by refraction and diffraction. By extension, a measurable range of activity, such as the range of bacteria affected by an antibiotic (antibacterial s.) or the complete range of manifestations of a disease. [EU]

Sporadic: Neither endemic nor epidemic; occurring occasionally in a random or isolated manner. [EU]

Spores: The reproductive elements of lower organisms, such as protozoa, fungi, and cryptogamic plants. [NIH]

Staphylococcus: A genus of gram-positive, facultatively anaerobic, coccoid bacteria. Its organisms occur singly, in pairs, and in tetrads and characteristically divide in more than one plane to form irregular clusters. Natural populations of Staphylococcus are membranes of warm-blooded animals. Some species are opportunistic pathogens of humans and animals. [NIH]

Stomach: An organ of digestion situated in the left upper quadrant of the abdomen between the termination of the esophagus and the beginning of the duodenum. [NIH]

Symptomatic: 1. pertaining to or of the nature of a symptom. 2. indicative (of a particular disease or disorder). 3. exhibiting the symptoms of a particular disease but having a different cause. 4. directed at the allying of symptoms, as symptomatic treatment. [EU]

Syphilis: A contagious venereal disease caused by the spirochete treponema pallidum. [NIH]

Systemic: Pertaining to or affecting the body as a whole. [EU]

Thermoregulation: Heat regulation. [EU]

Thyroxine: An amino acid of the thyroid gland which exerts a stimulating effect on thyroid metabolism. [NIH]

Toxic: Pertaining to, due to, or of the nature of a poison or toxin; manifesting the symptoms of severe infection. [EU]

Toxoplasma: A genus of protozoa parasitic to birds and mammals. T. gondii is one of the most common infectious pathogenic animal parasites of man. [NIH]

Tuberculosis: Any of the infectious diseases of man and other animals caused by species of mycobacterium. [NIH]

Ulceration: 1. the formation or development of an ulcer. 2. an ulcer. [EU]

Vaccine: A suspension of attenuated or killed microorganisms (bacteria, viruses, or rickettsiae), administered for the prevention, amelioration or treatment of infectious diseases. [EU]

Vibrio: A genus of vibrionaceae, made up of short, slightly curved, motile, gram-negative rods. Various species produce cholera and other gastrointestinal disorders as well as abortion in sheep and cattle. [NIH]

Viral: Pertaining to, caused by, or of the nature of virus. [EU]

Virulence: The degree of pathogenicity within a group or species of

microorganisms or viruses as indicated by case fatality rates and/or the ability of the organism to invade the tissues of the host. [NIH]

Viruses: Minute infectious agents whose genomes are composed of DNA or RNA, but not both. They are characterized by a lack of independent metabolism and the inability to replicate outside living host cells. [NIH]

Yersinia: A genus of gram-negative, facultatively anaerobic rod- to coccobacillus-shaped bacteria that occurs in a broad spectrum of habitats. [NIH]

General Dictionaries and Glossaries

While the above glossary is essentially complete, the dictionaries listed here cover virtually all aspects of medicine, from basic words and phrases to more advanced terms (sorted alphabetically by title; hyperlinks provide rankings, information and reviews at Amazon.com):

- **Dictionary of Medical Acronymns & Abbreviations** by Stanley Jablonski (Editor), Paperback, 4th edition (2001), Lippincott Williams & Wilkins Publishers, ISBN: 1560534605, **http://www.amazon.com/exec/obidos/ASIN/1560534605/icongroupinterna**
- **Dictionary of Medical Terms : For the Nonmedical Person (Dictionary of Medical Terms for the Nonmedical Person, Ed 4)** by Mikel A. Rothenberg, M.D, et al, Paperback - 544 pages, 4th edition (2000), Barrons Educational Series, ISBN: 0764112015, **http://www.amazon.com/exec/obidos/ASIN/0764112015/icongroupinterna**
- **A Dictionary of the History of Medicine** by A. Sebastian, CD-Rom edition (2001), CRC Press-Parthenon Publishers, ISBN: 185070368X, **http://www.amazon.com/exec/obidos/ASIN/185070368X/icongroupinterna**
- **Dorland's Illustrated Medical Dictionary (Standard Version)** by Dorland, et al, Hardcover - 2088 pages, 29th edition (2000), W B Saunders Co, ISBN: 0721662544, **http://www.amazon.com/exec/obidos/ASIN/0721662544/icongroupinterna**
- **Dorland's Electronic Medical Dictionary** by Dorland, et al, Software, 29th Book & CD-Rom edition (2000), Harcourt Health Sciences, ISBN: 0721694934, **http://www.amazon.com/exec/obidos/ASIN/0721694934/icongroupinterna**
- **Dorland's Pocket Medical Dictionary (Dorland's Pocket Medical Dictionary, 26th Ed)** Hardcover - 912 pages, 26th edition (2001), W B Saunders Co, ISBN: 0721682812, **http://www.amazon.com/exec/obidos/ASIN/0721682812/icongroupinterna/103-4193558-7304618**

- **Melloni's Illustrated Medical Dictionary (Melloni's Illustrated Medical Dictionary, 4th Ed)** by Melloni, Hardcover, 4th edition (2001), CRC Press-Parthenon Publishers, ISBN: 85070094X, **http://www.amazon.com/exec/obidos/ASIN/85070094X/icongroupinterna**
- **Stedman's Electronic Medical Dictionary Version 5.0 (CD-ROM for Windows and Macintosh, Individual)** by Stedmans, CD-ROM edition (2000), Lippincott Williams & Wilkins Publishers, ISBN: 0781726328, **http://www.amazon.com/exec/obidos/ASIN/0781726328/icongroupinterna**
- **Stedman's Medical Dictionary** by Thomas Lathrop Stedman, Hardcover - 2098 pages, 27th edition (2000), Lippincott, Williams & Wilkins, ISBN: 068340007X, **http://www.amazon.com/exec/obidos/ASIN/068340007X/icongroupinterna**
- **Tabers Cyclopedic Medical Dictionary (Thumb Index)** by Donald Venes (Editor), et al, Hardcover - 2439 pages, 19th edition (2001), F A Davis Co, ISBN: 0803606540, **http://www.amazon.com/exec/obidos/ASIN/0803606540/icongroupinterna**

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