

THE 2002 OFFICIAL
PATIENT'S SOURCEBOOK
on

SHIGELLOSIS



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AND PHILIP M. PARKER, PH.D., EDITORS

ICON Health Publications
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 4370 La Jolla Village Drive, 4th Floor
 San Diego, CA 92122 USA

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Printed in the United States of America.

Last digit indicates print number: 10 9 8 7 6 4 5 3 2 1

Publisher, Health Care: Tiffany LaRochelle
 Editor(s): James Parker, M.D., Philip Parker, Ph.D.

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Cataloging-in-Publication Data

Parker, James N., 1961-
 Parker, Philip M., 1960-

The 2002 Official Patient's Sourcebook on Shigellosis: A Revised and Updated Directory for the Internet Age/James N. Parker and Philip M. Parker, editors

p. cm.

Includes bibliographical references, glossary and index.

ISBN: 0-597-83338-9

1. Shigellosis-Popular works. I. Title.

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Dedication

To the healthcare professionals dedicating their time and efforts to the study of shigellosis.

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 shigellosis. 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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- 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 Sporotrichosis
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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

¹ Quotation from <http://www.drkoop.com>.

² The Agency for Healthcare Research and Quality (AHRQ):
<http://www.ahrq.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 2002 Official Patient's Sourcebook on Shigellosis* 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 shigellosis, 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 shigellosis.

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 shigellosis 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 shigellosis (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 shigellosis. It also gives you sources of information that can help you find a doctor in your local area specializing in treating shigellosis. Collectively, the material presented in Part I is a complete primer on basic research topics for patients with shigellosis.

Part II moves on to advanced research dedicated to shigellosis. 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 shigellosis. 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 shigellosis or related disorders. The appendices are dedicated to more pragmatic issues faced by many patients with shigellosis. 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 shigellosis.

Scope

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

- Shigella Gastroenteritis
- Shigellosis

In addition to synonyms and related conditions, physicians may refer to shigellosis 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 shigellosis:⁴

- 004.9 shigellosis, unspecified

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 shigellosis. 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 shigellosis will log on to the Internet, type words into a search engine, and receive several Web site listings which are mostly irrelevant or redundant. 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 shigellosis is even indexed in search engines, a non-systematic approach often leads to frustration and disappointment. With this sourcebook, we hope to direct you

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."

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 shigellosis, 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 shigellosis. 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 shigellosis to you or even given you a pamphlet or brochure describing shigellosis. 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 SHIGELLOSIS: GUIDELINES

Overview

Official agencies, as well as federally-funded institutions supported by national grants, frequently publish a variety of guidelines on shigellosis. 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 shigellosis 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 shigellosis. 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 shigellosis 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 shigellosis.

What Is Shigellosis?⁷

Shigellosis is an infectious disease caused by a group of bacteria called *Shigella*. Most who are infected with *Shigella* develop diarrhea, fever, and stomach cramps starting a day or two after they are exposed to the

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/shigellosis_g.htm.

bacterium. The diarrhea is often bloody. Shigellosis usually resolves in 5 to 7 days. In some persons, especially young children and the elderly, the diarrhea can be so severe that the patient needs to be hospitalized. A severe infection with high fever may also be associated with seizures in children less than 2 years old. Some persons who are infected may have no symptoms at all, but may still pass the *Shigella* bacteria to others.

What Sort of Germ Is Shigella?

The *Shigella* germ is actually a family of bacteria that can cause diarrhea in humans. They are microscopic living creatures that pass from person to person. *Shigella* were discovered over 100 years ago by a Japanese scientist named Shiga, for whom they are named. There are several different kinds of *Shigella* bacteria: *Shigella sonnei*, also known as “Group D” *Shigella*, accounts for over two-thirds of the shigellosis in the United States. A second type, *Shigella flexneri*, or “group B” *Shigella*, accounts for almost all of the rest. Other types of *Shigella* are rare in this country, though they continue to be important causes of disease in the developing world. One type found in the developing world, *Shigella dysenteriae* type 1, causes deadly epidemics there.

How Can Shigella Infections Be Diagnosed?

Many different kinds of diseases can cause diarrhea and bloody diarrhea, and the treatment depends on which germ is causing the diarrhea. Determining that *Shigella* is the cause of the illness depends on laboratory tests that identify *Shigella* in the stools of an infected person. These tests are sometimes not performed unless the laboratory is instructed specifically to look for the organism. The laboratory can also do special tests to tell which type of *Shigella* the person has and which antibiotics, if any, would be best to treat it.

How Can Shigella Infections Be Treated?

Shigellosis can usually be treated with antibiotics. The antibiotics commonly used for treatment are ampicillin, trimethoprim/sulfamethoxazole (also known as Bactrim* or Septra*), nalidixic acid, or ciprofloxacin. Appropriate treatment kills the *Shigella* bacteria that might be present in the patient’s stools, and shortens the illness. Unfortunately, some *Shigella* bacteria have become resistant to antibiotics and using antibiotics to treat shigellosis can

actually make the germs more resistant in the future. Persons with mild infections will usually recover quickly without antibiotic treatment. Therefore, when many persons in a community are affected by shigellosis, antibiotics are sometimes used selectively to treat only the more severe cases. Antidiarrheal agents such as loperamide (Imodium*) or diphenoxylate with atropine (Lomotil*) are likely to make the illness worse and should be avoided.

Are There Long Term Consequences to a Shigella Infection?

Persons with diarrhea usually recover completely, although it may be several months before their bowel habits are entirely normal. About 3% of persons who are infected with one type of Shigella, *Shigella flexneri*, will later develop pains in their joints, irritation of the eyes, and painful urination. This is called Reiter's syndrome. It can last for months or years, and can lead to chronic arthritis which is difficult to treat. Reiter's syndrome is caused by a reaction to Shigella infection that happens only in people who are genetically predisposed to it.

Once someone has had shigellosis, they are not likely to get infected with that specific type again for at least several years. However, they can still get infected with other types of Shigella.

How Do People Catch Shigella Infections?

The Shigella bacteria pass from one infected person to the next. Shigella are present in the diarrheal stools of infected persons while they are sick and for a week or two afterwards. Most Shigella infections are the result of the bacterium passing from stools or soiled fingers of one person to the mouth of another person. This happens when basic hygiene and hand washing habits are inadequate. It is particularly likely to occur among toddlers who are not fully toilet-trained. Family members and playmates of such children are at high risk of becoming infected.

Shigella infections may be acquired from eating contaminated food. Contaminated food may look and smell normal. Food may become contaminated by infected food handlers who forget to wash their hands with soap after using the bathroom. Vegetables can become contaminated if they are harvested from a field with sewage in it. Flies can breed in infected feces and then contaminate food. Shigella infections can also be acquired by drinking or swimming in contaminated water. Water may become

contaminated if sewage runs into it, or if someone with shigellosis swims in it.

What Can I Do to Prevent This Illness?

There is no vaccine to prevent shigellosis. However, the spread of *Shigella* from an infected person to other persons can be stopped by frequent and careful handwashing with soap. Frequent and careful handwashing is important among all age groups. Frequent, supervised handwashing of all children should be followed in day care centers and in homes with children who are not completely toilet-trained (including children in diapers). When possible, young children with a *Shigella* infection who are still in diapers should not be in contact with uninfected children.

People who have shigellosis should not prepare food or pour water for others until they have been shown to no longer be carrying the *Shigella* bacterium.

If a child in diapers has shigellosis, everyone who changes the child's diapers should be sure the diapers are disposed of properly in a closed-lid garbage can, and should wash his or her hands carefully with soap and warm water immediately after changing the diapers. After use, the diaper changing area should be wiped down with a disinfectant such as household bleach, Lysol* or bactericidal wipes.

Basic food safety precautions and regular drinking water treatment prevents shigellosis. At swimming beaches, having enough bathrooms near the swimming area helps keep the water from becoming contaminated.

Simple precautions taken while traveling to the developing world can prevent getting shigellosis. Drink only treated or boiled water, and eat only cooked hot foods or fruits you peel yourself. The same precautions prevent traveler's diarrhea in general.

How Common Is Shigellosis?

Every year, about 18,000 cases of shigellosis are reported in the United States. Because many milder cases are not diagnosed or reported, the actual number of infections may be twenty times greater. Shigellosis is particularly common and causes recurrent problems in settings where hygiene is poor and can sometimes sweep through entire communities. Shigellosis is more

common in summer than winter. Children, especially toddlers aged 2 to 4, are the most likely to get shigellosis. Many cases are related to the spread of illness in child-care settings, and many more are the result of the spread of the illness in families with small children.

In the developing world, shigellosis is far more common and is present in most communities most of the time.

What Else Can Be Done to Prevent Shigellosis?

It is important for the public health department to know about cases of shigellosis. It is important for clinical laboratories to send isolates of *Shigella* to the City, County or State Public Health Laboratory so the specific type can be determined and compared to other *Shigella*. If many cases occur at the same time, it may mean that a restaurant, food or water supply has a problem which needs correction by the public health department. If a number of cases occur in a day-care center, the public health department may need to coordinate efforts to improve handwashing among the staff, children, and their families. When a community-wide outbreak occurs, a community-wide approach to promote handwashing and basic hygiene among children can stop the outbreak. Improvements in hygiene for vegetables and fruit picking and packing may prevent shigellosis caused by contaminated produce.

Some prevention steps occur everyday, without you thinking about it. Making municipal water supplies safe and treating sewage are highly effective prevention measures that have been in place for many years.

What Is the Government Doing about Shigellosis?

The Centers for Disease Control and Prevention (CDC) monitors the frequency of *Shigella* infections in the country, and assists local and State health departments to investigate outbreaks, determine means of transmission and devise control measures. CDC also conducts research to better understand how to identify and treat shigellosis. The Food and Drug Administration inspects imported foods, and promotes better food preparation techniques in restaurants and food processing plants. The Environmental Protection Agency regulates and monitors the safety of our drinking water supplies. The government has also maintained active research into the development of a *Shigella* vaccine.

How Can I Learn More about Public Health Problems?

You can discuss any medical concerns you may have with your doctor or other health care provider. Your local city or county health department can provide more information about this and other public health problems that are occurring in your area. General information about the public health of the nation is published every week in the “Morbidity and Mortality Weekly Report”, by the CDC in Atlanta, GA. Epidemiologists in your local and State Health Departments are tracking a number of important public health problems, investigating special problems that arise, and helping to prevent them from occurring in the first place, or from spreading if they do occur.

Tips for Preventing the Spread of Shigellosis

- Wash hands with soap carefully and frequently, especially after going to the bathroom, after changing diapers, and before preparing foods or beverages
- Dispose of soiled diapers properly
- Disinfect diaper changing areas after using them
- Keep children with diarrhea out of child care settings
- Supervise handwashing of toddlers and small children after they use the toilet
- Persons with diarrheal illness should not prepare food for others
- If you are traveling to the developing world, “boil it, cook it, peel it, or forget it”
- Avoid drinking pool water⁸

Shigellosis: Technical Notes

The Division of Bacterial and Mycotic Diseases of the CDC publishes summary information on shigellosis 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 shigellosis that can help the doctor with diagnosis. It may also

⁸ For more information on this subject see:
<http://www.cdc.gov/ncidod/dpd/highlight2/index.htm>.

include a discussion of the cause or “etiology” of shigellosis. “Etiologic agent” signifies the particular organism, typically written in Latin, which causes or is associated with shigellosis. “Reservoir” indicates the habitat or living environment of the organism. “Incidence” describes the number of people that are diagnosed with shigellosis within a given population. “Sequelae” includes any related health consequences or secondary pathological conditions and diseases that may result from shigellosis. “Transmission” describes how a disease spreads. “Risk Groups” are people who are most likely to be diagnosed with shigellosis. “Surveillance” describes how shigellosis 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 shigellosis in the future. The notes that follow were recently published by the CDC.⁹

Clinical Features

Watery or bloody diarrhea, abdominal pain, fever, and malaise.

Etiologic Agent

Four species of *Shigella*: *boydii*, *dysenteriae*, *flexneri*, and *sonnei*.

Incidence

Approximately 14,000 laboratory confirmed cases of shigellosis and an estimated 448,240 total cases (mostly due to *S. sonnei*) occur in the United States each year. In the developing world, *S. flexneri* predominates. Epidemics of *S. dysenteriae* type 1 have occurred in Africa and Central America with case fatality rates of 5-15%.

Sequelae

Reiter’s syndrome is a late complication of *S. flexneri* infection, especially in persons with the genetic marker HLA-B27. Hemolytic-uremic syndrome can occur after *S. dysenteriae* type 1 infection. Convulsions may occur in children, but the mechanism has not been established.

⁹ Adapted from The Centers for Disease Control and Prevention (CDC):
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/shigellosis_t.htm.

Transmission

A small inoculum (10 to 200 organisms) is sufficient to cause infection. As a result, person-to-person spread can easily occur by the fecal-oral route and occurs more commonly than transmission by food and water. Large foodborne outbreaks have occurred.

Risk Groups

In the United States, groups at increased risk of shigellosis include children in child-care centers and persons in custodial institutions, where personal hygiene is difficult to maintain; Native Americans; orthodox Jews; international travelers; men who have sex with men; and those in homes with inadequate water for hand washing.

Surveillance

All reported cases are laboratory-confirmed in states or at CDC.

Trends

Modest decrease in cases since 1995.

Challenges

Increasing resistance to available antimicrobial agents among isolates acquired domestically and abroad; absence of effective vaccines; modifying handwashing behavior to control prolonged community-wide outbreaks; identifying targeted prevention measures in high-risk groups (e.g., Native Americans, Orthodox Jews, men who have sex with men).

Opportunities

A major initiative to strengthen laboratory, epidemiologic, and public health capacity to detect and respond to epidemic *S.dysenteriae* type 1 in southern Africa could be duplicated in other regions at risk. Partnerships with local health departments and communities may lead to investigations of

transmission and new prevention materials. Subtyping of *S. sonnei* by pulsed field gel electrophoresis can improve outbreak detection and control.

Additional Technical Information

Surveillance

CDC currently has six surveillance systems for obtaining information about *Shigella*. They serve different purposes and provide information on various features of the organism's epidemiology, such as number of outbreaks, antimicrobial-resistant infections, or subtypes.

- **Public Health Laboratory Information System (PHLIS):** PHLIS is a passive, laboratory-based surveillance system that collects data about many infections, including *Shigella*. Reporting is limited to illnesses that are confirmed by culture and verified at the state public health laboratory. After verification, information about the infection is reported electronically to CDC by the state: <http://www.cdc.gov/ncidod/dbmd/phlisdata>. Annual summaries of the PHLIS *Shigella* surveillance data can be found at <http://www.cdc.gov/ncidod/dbmd/phlisdata/shigella.htm>.
- **National Electronic Telecommunications System for Surveillance (NETSS):** NETSS is a passive, physician-based surveillance system that captures both laboratory-confirmed and clinically suspected cases of all nationally notifiable diseases, including *Shigella*. The number of illnesses reported through NETSS tends to be higher than the number reported through PHLIS because NETSS does not require confirmation by the state public health laboratory. More information on NETSS can be found at <http://www.cdc.gov/epo/dphsi/netss.htm>. *Shigella* infections and other surveillance data collected by NETSS is published weekly in the CDC Morbidity and Mortality Report (MMWR) and can be found at <http://www2.cdc.gov/mmwr>. The MMWR also publishes an annual summary of the NETSS *Shigella* surveillance data; this information can be found at <http://www2.cdc.gov/mmwr/summary.html>.
- **FoodNet:** The Foodborne Diseases Active Surveillance Network (FoodNet) is an active surveillance system for identifying and characterizing culture-confirmed infections that may be foodborne, including *Shigella*. FoodNet workers regularly contact more than 300 laboratories for confirmed cases of foodborne infections in several states

encompassing a population of more than 25 million persons. In addition to monitoring the number of *Shigella* infections, investigators monitor laboratory techniques for isolation of bacteria, perform case-control studies of ill persons to determine foods associated with illness, and administer questionnaires to people living in FoodNet sites to better understand trends in the eating habits of Americans. Annual FoodNet reports that include data about *Shigella* can be found at <http://www.cdc.gov/foodnet/annuals.htm>. More information on FoodNet can be found at <http://www.cdc.gov/foodnet/>.

- **National Molecular Subtyping Network for Foodborne Diseases Surveillance (PulseNet):** PulseNet is a national network of public health laboratories that perform pulsed-field gel electrophoresis (PFGE), a type of DNA “fingerprinting”, on certain foodborne bacteria, including *Shigella*. PFGE “fingerprint” patterns are submitted electronically to CDC and can be compared rapidly with others in a large database. This system can help determine if individual infections are related or if an outbreak is occurring. PulseNet is not a surveillance system itself but a laboratory subtyping method used in surveillance. More information on PulseNet can be found at <http://www.cdc.gov/pulsenet>.
- **National Antimicrobial Resistance Monitoring System (NARMS):** NARMS is a passive surveillance system that monitors antimicrobial resistance of *Shigella* and selected other bacteria that cause human illness. NARMS is a collaboration between CDC, 16 state and local health departments, the Food and Drug Administration (FDA), and the United States Agricultural Department (USDA). More information on NARMS can be found at <http://www.cdc.gov/narms>.
- **Foodborne Outbreak Detection Unit:** CDC monitors outbreaks of foodborne disease, including outbreaks caused by *Shigella*. Each year, state and territorial epidemiologists voluntarily (passively) report the results of outbreak investigations to CDC. While outbreaks account for a small percentage of the total number of illnesses that occur each year, these investigations provide valuable information about sources of foodborne infection and often highlight important prevention opportunities. The latest summaries of foodborne outbreaks can be found at the following Web address: <http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/ss4901a1.htm>.

Morbidity and Mortality Weekly Report (MMWR) Articles

- Outbreak of Gastroenteritis Associated with an Interactive Water Fountain at a Beachside Park - Florida, 1999. MMWR June 30, 2000 /

49(25);565-8:

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm4925a3.htm>

- Outbreaks of *Shigella sonnei* infection associated with eating fresh parsley - United States and Canada, July - August 1998. MMWR April 16, 1999 / 48(14);285-9:
<http://www.cdc.gov/mmwr/preview/mmwrhtml/00056895.htm>
- *Shigella sonnei* Outbreak Associated with Contaminated Drinking Water - Island Park, Idaho, August 1995 MMWR March 22, 1996 / Vol. 45 / No. 11: <http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/00040669.htm>

Links

- CDC Safe Water System: <http://www.cdc.gov/safewater>
- FoodNet: <http://www.cdc.gov/foodnet>
- Laboratory Methods for the Diagnosis of Epidemic Dysentery and Cholera:
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/cholera_lab_manual.htm
- PHLIS Data: <http://www.cdc.gov/ncidod/dbmd/phlisdata>

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- Townes JM, Quick R, Gonzales O, et al. Etiology of Bloody Diarrhea in Bolivian Children: Implications for Empiric Therapy. *The Journal of Infectious Diseases*, 1997;175:1527-30.
- Mohle-Boetani JC, Stapleton M, Finger R, et al. Community-wide shigellosis: control of an outbreak and risk factors in child day-care centers. *Am J Public Health* 1995; 85:812-6.
- Ries AA, Wells JG, Olivola D, et al. Epidemic *Shigella dysenteriae* type 1 in Burundi: panresistance and implications for prevention. *J Infect Dis* 1994; 169:1035-41.
- Lee LA, Shapiro CN, Hargrett-Bean N, Tauxe RV. Hyperendemic shigellosis in the United States: a review of surveillance data for 1967-1988. *J Infect Dis* 1991; 164:894-900.

More Guideline Sources

The guideline above on shigellosis 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 shigellosis. 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 shigellosis. 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 the following: **<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 shigellosis 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 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 “shigellosis” 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=shigellosis

- **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=shigellosis

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:

- **Foodborne Diseases**

Summary: This online fact sheet provides a description of the more common and serious foodborne illnesses -- Escherichia coli (E. coli), Salmonellosis, Campylobacteriosis, and Shigellosis.

Source: National Institute of Allergy and Infectious Diseases, National Institutes of Health

<http://www.healthfinder.gov/scripts/recordpass.asp?RecordType=0&RecordID=2381>

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 shigellosis. 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:

Ampicillin: Semi-synthetic derivative of penicillin that functions as an orally active broad-spectrum antibiotic. [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]

Atropine: A toxic alkaloid, originally from *Atropa belladonna*, but found in other plants, mainly Solanaceae. [NIH]

Bacteria: Unicellular prokaryotic microorganisms which generally possess rigid cell walls, multiply by cell division, and exhibit three principal forms: round or coccid, rodlike or bacillary, and spiral or spirochetal. [NIH]

Chlamydia: A genus of the family chlamydiaceae whose species cause a variety of diseases in vertebrates including humans, mice, and swine. Chlamydia species are gram-negative and produce glycogen. The type species is *chlamydia trachomatis*. [NIH]

Ciprofloxacin: A carboxyfluoroquinoline antimicrobial agent that is effective against a wide range of microorganisms. It has been successfully and safely used in the treatment of resistant respiratory, skin, bone, joint, gastrointestinal, urinary, and genital infections. [NIH]

Convulsion: A violent involuntary contraction or series of contractions of the voluntary muscles. [EU]

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

Diphenoxylate: A meperidine congener used as an antidiarrheal, usually in combination with atropine. At high doses, it acts like morphine. Its unesterified metabolite difenoxin has similar properties and is used similarly. It has little or no analgesic activity. [NIH]

Dysentery: Any of various disorders marked by inflammation of the intestines, especially of the colon, and attended by pain in the abdomen, tenesmus, and frequent stools containing blood and mucus. Causes include chemical irritants, bacteria, protozoa, or parasitic worms. [EU]

Electrophoresis: An electrochemical process in which macromolecules or colloidal particles with a net electric charge migrate in a solution under the influence of an electric current. [NIH]

Epidemic: Occurring suddenly in numbers clearly in excess of normal expectancy; said especially of infectious diseases but applied also to any disease, injury, or other health-related event occurring in such outbreaks. [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]

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]

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]

Gonorrhea: Acute infectious disease characterized by primary invasion of the urogenital tract. The etiologic agent, *neisseria gonorrhoeae*, was isolated by Neisser in 1879. [NIH]

Hepatitis: Inflammation of the liver. [EU]

Herpes: Any inflammatory skin disease caused by a herpesvirus and characterized by the formation of clusters of small vesicles. When used alone, the term may refer to herpes simplex or to herpes zoster. [EU]

Malaise: A vague feeling of bodily discomfort. [EU]

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

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

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

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

Seizures: Clinical or subclinical disturbances of cortical function due to a sudden, abnormal, excessive, and disorganized discharge of brain cells. Clinical manifestations include abnormal motor, sensory and psychic phenomena. Recurrent seizures are usually referred to as epilepsy or "seizure disorder." [NIH]

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]

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

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

Urethritis: Inflammation of the urethra. [EU]

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

Warts: Benign epidermal proliferations or tumors; some are viral in origin. [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 shigellosis. 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.¹⁰ 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 shigellosis. The chapter ends with a discussion on how to find a doctor that is right for you.

Associations and Shigellosis

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.¹¹ 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

¹⁰ Churches, synagogues, and other houses of worship might also have groups that can offer you the social support you need.

¹¹ 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 shigellosis. 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 "shigellosis" (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 "shigellosis". 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 “shigellosis” (or synonyms) into the “For these words:” box, you will only receive results on organizations dealing with shigellosis. 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 “shigellosis” (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 shigellosis 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:¹²

- 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.

¹² 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>**.¹³ 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.

¹³ 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 Doctor¹⁴

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 shigellosis?
- 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 shigellosis?
- 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 Doctor¹⁵

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.

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

¹⁵ 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:¹⁶

- 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>

¹⁶ 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 shigellosis. 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 shigellosis. In Part II, as in Part I, our objective is not to interpret the latest advances on shigellosis 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 shigellosis is suggested.

CHAPTER 3. STUDIES ON SHIGELLOSIS

Overview

Every year, academic studies are published on shigellosis 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 shigellosis. 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 shigellosis 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 shigellosis, 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 "shigellosis" (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:

- **Outbreak of Shigellosis at an Outdoor Music Festival**

Source: American Journal of Epidemiology. 133(6): 608-615. 1991.

Summary: In August 1988, an estimated 3,175 women who attended a 5-day outdoor music festival in Michigan became ill with gastroenteritis caused by *Shigella sonnei*. Onset of illness peaked 2 days after the festival ended, and patients were spread throughout the United States by the time the outbreak was recognized. Limited access to soap and running water for handwashing was one of the few sanitary deficits noted at this gathering. This investigation demonstrates the need for surveillance and prompt public health intervention when *Shigella* infections are recognized in persons attending mass outdoor gatherings, the singular importance of handwashing in reducing secondary transmission of shigellosis, and the potential for explosive outbreaks when communal meals are prepared by large numbers of food handlers. 1 figure. 2 tables. 18 references. (AA-M).

- **Community Outbreaks of Shigellosis: United States**

Source: MMWR. Morbidity and Mortality Weekly Report. 39(30): 509-513, 519. August 3, 1990.

Summary: Since 1986 the incidence of shigellosis in the United States has increased in all regions of the country. Many community-wide shigellosis outbreaks that have been difficult to control have been reported. This report describes four community outbreaks of shigellosis during 1986-1989 in which innovative public health control measures were used. Communities reported on are: Kankakee County, IL; Peoria County, IL; Orange County, NY; and Caddo County, OK. An editorial note to the report provides suggestions for shigellosis control efforts. 4 figures. 6 references. (AA-M).

Federally-Funded Research on Shigellosis

The U.S. Government supports a variety of research studies relating to shigellosis and associated conditions. These studies are tracked by the Office of Extramural Research at the National Institutes of Health.¹⁷ CRISP (Computerized Retrieval of Information on Scientific Projects) is a searchable database of federally-funded biomedical research projects conducted at universities, hospitals, and other institutions. Visit the CRISP Web 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 shigellosis 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 shigellosis 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 shigellosis:

- **Project Title: Epidemiology of Shigellosis in the Peruvian Amazon**

Principal Investigator & Institution: Kosek, Margaret N.; International Health; Johns Hopkins University 3400 N Charles St Baltimore, Md 21218

Timing: Fiscal Year 2001; Project Start 5-SEP-2001; Project End 1-JUL-2004

Summary: (provided by applicant): Shigellosis is the principal cause of clinical dysentery and a frequent cause of morbidity and mortality in children living in impoverished areas. Due to rapid appearance and spread of multiply antibiotic resistant strains and the lack of an available vaccine the morbidity and mortality from shigellosis is likely to increase without improved disease control measures. The proposed study will 1) determine the community incidence rates of shigellosis and risk factors for the development of shigellosis in children under six years of age in the Peruvian Amazon; 2) characterize the relative importance of different routes of transmission by the genotyping of isolates from patients, family members, and household environmental sources; and 3) determine the diversity of isolates obtained in households of children with shigellosis

¹⁷ 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 and Prevention (CDCP), Agency for Healthcare Research and Quality (AHRQ), and Office of Assistant Secretary of Health (OASH).

and control households by genomic analysis, serotype, and antibiotic sensitivity profile. These data will contribute to an improved understanding of the epidemiology of shigellosis in an endemic area and therefore serve as the basis for the definition of the most highly effective interventions. The information on the serotypic diversity in the population as a whole and in households with children with dysentery will provide important data useful in vaccine development and establish this as a candidate site for future vaccine trials. The development and evaluation of a rapid highly discriminatory molecular typing system that is more readily applicable in less developed regions will facilitate future investigation in endemic areas. The collaborative team that is brought together to conduct the proposed study is an established international group of microbiologists, molecular geneticists, epidemiologists, and physicians with extensive experience training junior scientists in an international setting. This project will further strengthen these international connections in the process of the training of a junior clinician-scientist.

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

- **Project Title: Evaluate Safety of Vaccines to Prevent Shigellosis**

Principal Investigator & Institution: Paswell, Justen; ; Chaim Sheba Medical Center Tel Hashomer 52621, Israel Tel Hashomer,

Timing: Fiscal Year 2000; Project Start 0-SEP-1995; Project End 0-APR-2000

Summary: The purpose of this project is to conduct a clinical evaluation of the safety, immunogenicity and efficacy in children in an endemic area of investigational vaccines designed to prevent shigellosis. The contractor is to perform Phase 2 study (safety and immunogenicity) of *Shigella flexneri* type 2a EPA and *S. sonnei* EPA conjugate vaccines in children aged 4 to 6 years old. Each vaccine shall be injected into 50 children, ages 4 to 6 years old. A total of 100 children shall be vaccinated. One hundred children, who have received the Hepatitis B vaccine shall serve as controls for this study. This project has been approved by the NIH (Protocol Number OH94-CH-NO94) and FDA (BB-IND-4331-S. *Sonnei* and BB-IND- 3866-S. *flexneri*).

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

- **Project Title: Shigellosis--Role of Intestinal Epithelium**

Principal Investigator & Institution: Mc Cormick, Beth A.; Assistant Professor; Massachusetts General Hospital 55 Fruit St Boston, Ma 02114

Timing: Fiscal Year 2000; Project Start 1-APR-1984; Project End 9-SEP-2005

Summary: *Shigella* organisms are a group of gram negative bacilli that cause acute bacillary dysentery in humans. The signature feature of this disease is exhibited by an intense inflammatory reaction manifested clinically as diarrhea. Humans and some non-human primates, namely Old World monkeys in Africa and Asia serve as the only hosts that are naturally susceptible to *Shigella* infection. The relationship between *Shigella* and the human intestinal epithelium and the subsequent inflammatory response, which determines clinical virulence, is undoubtedly complicated and very little information is known pertaining to this process. Thus, utilizing a well characterized in vitro reductionistic system, the broad long-term objectives of this proposal are to examine the nature of the species dependency exhibited by *Shigella* with the human intestine and elucidate the molecular and cellular bases by which *Shigella* foster acute infectious colitis. The specific aims of this proposal are ultimately directed at achieving this goal, and are two-fold: Specific Aim 1 is designed to understand which *Shigella* factors are essential in triggering the mucosal inflammatory response induced by *S. flexneri*. We will determine which genetic determinants are required for *Shigella* to induce PMN signaling across intestinal epithelial cell monolayers. We will also define the contribution of *Shigella* secreted proteins in *Shigella*-induce mucosal inflammation. Specific Aim 2 is designed to examine the host epithelial cell factors that are induced in response to *S. flexneri* which lead to an active state of intestinal inflammation. We will purify and identify a novel *Shigella*-elicited neutrophil chemotactic factor which directs PMN migration across the intestinal epithelium. Once we understand the molecular mechanisms by which *Shigella*-intestinal epithelial interactions orchestrate this response it may be possible to develop novel therapeutic strategies aimed at treatments for and ameliorating disease.

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

- **Project Title: Intracellular Trafficking of Immunotoxins**

Principal Investigator & Institution: Press, Oliver W.; Professor; Medicine; University of Washington Seattle, Wa 98195

Timing: Fiscal Year 2000; Project Start 1-MAR-1992; Project End 1-DEC-2000

Summary: (Adapted from the applicant's abstract): Immunotoxins synthesized by conjugating cytotoxic plant proteins to monoclonal antibodies recognizing tumor-associated antigens have appeared promising in pre-clinical studies but have shown only modest efficacy so

far in clinical trials. To kill target cells, immunotoxins must be internalized after binding to surface antigens and a commonly used plant protein, ricin A-chain must be delivered to cytosolic ribosomes where the 60S subunit is irreversibly inactivated. The overall objective of this project is to investigate methods of manipulating the intracellular routing of immunotoxins, so that the therapeutic index can be improved. Emphasis will be placed on facilitating translocation of toxins to the cytosol since this is the rate-limiting step in cell intoxication. Four specific goals are enunciated: First, the investigator will identify and characterize the membrane proteins normally involved in ricin A-chain translocation by a "nearest neighbor" cross-linking strategy. The importance of translocation-associated membranes identified by cross-linking will be verified by membrane glycoprotein depletion and reconstitution experiments. Second, the prevailing hypothesis will be tested that endoplasmic reticulum "translocon" pores are critical for toxin translocation by selective immunodepletion of the Sec 61p and TRAM proteins which are known to be essential structural and functional components of the ER translocon channels. Third, mutant ricin A-chain constructs will be genetically engineered which express in tandem amino acid sequences targeting the toxin to translocation-competent intracellular compartments (e.g., GOLGI, ER) followed by sequences possessing novel "pore-forming" domains (e.g., GALA) for membrane penetration. Fourth, the translocation efficiency of immunotoxins will be enhanced by chemical conjugation to polycarboxylic acids (e.g., polypropylacrylic acid) which undergo conformational changes upon transfer from the neutral extracellular compartment to the acidic environment of endosomal compartments. These conformational changes result in endosomal membrane disruption permitting rapid egress of ricin A-chain to the cytosome. It is believed in a more complete comprehension of the events involved in the intracellular trafficking and translocation of ricin A-chain should permit synthesis of more effective clinical reagents. Furthermore, the studies in this project are believed to be important independent of immunotoxin therapy since similar toxins mediate many important medical syndromes (diphtheria, Shigellosis, Cholera, Pseudomonas shock) and because the basic mechanisms underlying protein translocation across biological membranes remain poorly understood.

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

- **Project Title: IPAC-Mediated Invasion of Epithelial Cells by Shigella**

Principal Investigator & Institution: Picking, William D.; Molecular Biosciences; University of Kansas Lawrence Lawrence, Ks 66045

Timing: Fiscal Year 2000; Project Start 1-SEP-1997; Project End 1-AUG-2002

Summary: (Adapted from the applicant's abstract): *Shigella* are gram negative enteric pathogens that cause bacillary dysentery, a serious world-wide health threat. An important feature of shigellosis is bacterial entry into nonphagocytic host cells. The invasion plasmid antigens (Ipa proteins) have been identified as the invasins of this process; however, their precise biochemical functions are not known. The long-range objective of this research is to determine the structural and functional features of these invasins from *Shigella flexneri*. To achieve these goals, the *ipa* genes were cloned, expressed, their products purified, and the biochemistry of the proteins investigated. IpaC was found to possess in vitro properties related to bacterial internalization. Therefore, the specific aims of the proposed work are: 1) to define the biochemical events that follow IpaC binding to host cells; 2) to determine mechanisms by which IpaC causes uptake of virulent and avirulent strains of *S. flexneri*; 3) to use purified IpaB, C, and D to investigate formation of protein complexes that facilitate invasion in vivo; and 4) to identify the functional domains of IpaC. These aims will be completed using diverse methodologies in cell biology and biochemistry in conjunction with specialized fluorescence techniques. IpaC functional domains will be identified using monoclonal antibodies and polyclonal immune sera which recognize defined epitopes and are characterized with respect to inhibitory or stimulatory activities on *Shigella* invasiveness. These studies will enhance understanding of *S. flexneri* invasion and serve to identify important new biochemical targets for prevention and treatment of bacillary dysentery.

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

- **Project Title: *Listeria* and *Shigella* Use Host Cell Actin**

Principal Investigator & Institution: Southwick, Frederick S.; Professor; Medicine; University of Florida Gainesville, FL 32611

Timing: Fiscal Year 2002; Project Start 1-JUL-1993; Project End 1-MAY-2007

Summary: (provided by applicant): The gram-positive bacillus *Listeria monocytogenes* predominantly infects immunocompromised patients, causing bacteremia and meningitis while the gram-negative bacillus *Shigella flexneri* infects normal hosts causing severe diarrhea and dehydration. The pathogenesis of *Listeriosis* and *Shigellosis* absolutely requires these intracellular bacteria to usurp the host cell's contractile system. *Listeria* and *Shigella* induce host cell actin to assemble into rocket tails that rapidly propel the bacteria through the cytoplasm, allowing

their cell-to-cell spread and avoidance of the humoral immune system. Actin assembly occurs in a discrete polymerization zone directly behind the motile bacteria. This region blocks the host cell actin-regulatory proteins, gelsolin, CapZ and CapG, that normally cap the fast growing ends of actin filaments. This blocking activity allows actin filaments to rapidly assemble in this discrete zone. Two of these proteins, gelsolin and CapG, require micromolar calcium to function. We will: Aim I - Elucidate how *Listeria* blocks barbed end-capping proteins in the polymerization zone. Pyrenyl actin and right angle light scattering will be used to examine how profilin combined PIP2 and VASP or N-WASP effects actin filament capping by CapG, CapZ and gelsolin. Capping inhibition by *Listeria* will be investigated in brain cell free extracts before and after depletion of profilin and VASP. Localization of PIP2 (well known to block capping activity) in *Listeria* and *Shigella* infected cells will be studied using a GFP labeled probe. The effects of blocking PIP2 production using the PI kinase inhibitors Wortmannin and quercetin, infecting cells with *Listeria* ActA mutants lacking PIP2 binding sites, and ActA mutants lacking VASP binding sites will be examined. Aim II - Study the Calcium-Dependence of *Listeria* and *Shigella* actin-based motility. Calcium is a critical signal for turning on and off actin regulatory proteins, and we have found that the chelator BAPTAM blocks *Shigella* actin-based motility and slows the disassembly of *Listeria* rocket tails. The Ca^{2+} -sensitivity of N-WASP and vinculin, cell proteins unique to *Shigella*-induced actin assembly, as well as gelsolin will be studied. These investigations should clarify key regulatory pathways required for *Listeria*- and *Shigella*-induced actin assembly and may identify new therapeutic targets for treating Listeriosis and Shigellosis.

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

- **Project Title: Mid Career Investigator Award in Patient Oriented Research**

Principal Investigator & Institution: Bennish, Michael L.; Director; New England Medical Center Hospitals 750 Washington St Boston, Ma 02111

Timing: Fiscal Year 2000; Project Start 1-JUL-1999; Project End 0-JUN-2004

Summary: RESUME: Support for five years is recommended for this super outstanding application submitted by Michael L. Bennish, M.D., Associate Professor of Medicine, Pediatrics and Community Health at New England Medical Center, Tufts University School of Medicine for a Midcareer Investigational Award in Patient-Oriented Research. This is an outstanding application notable for its clarity, attention to detail, and conveyance of the essence of performing high quality research and

mentoring in developing countries. All aspects of the proposal - the candidate's qualifications, and track record as a mentor and clinical researcher, the environment and institutional commitment, quality of the proposed research, and quality of the mentoring program - are outstanding. He has lived and worked for 6 years in Bangladesh, and he has close ties to hospitals in Dhaka and Durban. He has 50 publications, is well funded for POR, continues to be productive and is currently working on the value of enhanced nutritional support on clinical and viral load markers in children with AIDS in South Africa, short course therapy for diarrhea and cost-effective algorithms for patients with diarrhea. He will examine antibiotic efficacy for cholera and shigellosis, the value of micro-nutrient and enhanced nutrition in diarrhea, the epidemiology of diarrhea in HIV(+) and HIV(-) children in Durban. His work could have very significant public health implications. The proposal is clear, succinct and scientifically sound. This application should serve as a template for future applicants. (Adapted from application abstract): This K24 application requests funding for the candidate to pursue clinically oriented research at three sites: New England Medical Center in Boston; the University of Natal, Durban, South Africa; and the International Center for Diarrheal Disease Research in Dhaka, Bangladesh. The research studies focus on diarrheal diseases and the effects of antibiotic therapy, micronutrient supplementation, and HIV infection on the health of children and adults with diarrhea. Persons to be mentored by the Principal Investigator include junior faculty, fellows, medical students and graduate students from the New England Medical Center as well as trainees from the international centers at which the research will be conducted.

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

- **Project Title: Molecular Genetic Analysis of Shigella Pathogenicity**

Principal Investigator & Institution: Maurelli, Anthony T.; Professor; Henry M. Jackson Fdn for the Adv Mil/Med the Advancement of Military Med Bethesda, Md 20814

Timing: Fiscal Year 2000; Project Start 1-DEC-1988; Project End 1-DEC-2002

Summary: (Adapted from the applicant's abstract): Shigella are bacterial pathogens of man which are the causative agents of bacillary dysentery. Over 200 million cases are reported annually and about 650,000 persons die of shigellosis each year. No effective vaccine exists. Shigella is a classic example of an invasive, facultative intracellular pathogen which coordinately regulates expression of its virulence genes in response to environmental signals. The long term objectives of this proposal are to

address two areas of pathogenesis: how *Shigella* regulates expression of its virulence genes in response to environmental stimuli and how certain essential virulence gene products are transported (via a type III secretion system) across the bacterial membrane. The specific aims are to: 1) examine the mechanisms by which *Shigella* regulates its virulence genes in response to temperature; and 2) elucidate the mechanism by which components of the type III secretion system of *Shigella* interact and recognize virulence proteins which are targeted for secretion. Several models and experimental strategies for testing them are proposed. Genetic and biochemical approaches for measuring DNA-protein interactions will be utilized in the first aim. For aim two, interactions between components of the type III secretion machinery will be detected by use of the two-hybrid system while mutant selection will be applied to define secretion signals recognized by this pathway. This research will fill in important gaps in our knowledge of *Shigella* pathogenesis. An understanding of the mechanisms that control expression of temperature-regulated virulence genes in *Shigella* can lead to the development of specific drugs that block expression of virulence by disrupting the temperature sensing system. Information on how bacteria like *Shigella* recognize and secrete virulence factors can reveal novel targets for the design of new therapeutic agents against these pathogens.

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

- **Project Title: Molecular Mechanisms of Bacterial Mediated Apoptosis**

Principal Investigator & Institution: Basilio, Claudio; Professor and Chairman; Skirball Institute; New York University School of Medicine 550 1st Ave New York, Ny 10016

Timing: Fiscal Year 2001; Project Start 1-APR-1998; Project End 1-MAR-2003

Summary: (Adapted from the applicant's abstract): Bacillary dysentery is an acute inflammatory disease of the colon caused by the Gram negative bacteria *Shigella*. Shigellosis has great epidemiological importance, especially among infants and young children where it can be fatal. This infection is the second most common enteric notifiable disease in the United States. *Shigella* initiates an acute inflammation that causes major tissue destruction, facilitates tissue invasion by the bacteria, and eventually eradicates them. Virulent *Shigella* induce rapid macrophage apoptosis and a concomitant release of large amounts of Interleukin-1 (IL-1). IL-1 is a major component of the inflammatory cascade initiated by *Shigella*. The Invasion Plasmid Antigen B (IpaB) is the *Shigella* invasin that causes macrophage apoptosis. We have recently shown that IpaB binds to IL-1 beta converting enzyme (ICE) and that ICE activation is

essential for both macrophage apoptosis and IL-1 beta release in *Shigella* infections. Recently, both *Salmonella typhi* and *S. typhimurium* were shown to induce apoptosis in macrophages and to encode a protein, SipB, that is homologous to IpaB and is required for *Salmonella* cytotoxicity. Thus, the induction of apoptosis appears to be a common virulence mechanism among these two pathogens. Our previous results indicate that the interaction between IpaB and ICE is crucial in the pathogenesis of shigellosis. Here, we propose to: study the mechanisms of ICE activation by IpaB (Aim 1), initiate a structure-function analysis of IpaB (Aim 2), identify other macrophage components necessary for the induction of apoptosis by IpaB (Aim 3), and determine whether IpaB and SipB have analogous function (Aim 4). The study of the interaction between IpaB and ICE will allow us to design novel therapies and, more importantly, new vaccines for dysentery and possibly other infectious diseases.

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

- **Project Title: Protective Immune Mechanisms in Human *Shigella* Vaccines**

Principal Investigator & Institution: Samandari, Taraz; Pediatrics; University of Maryland Balt Prof School Professional Schools Baltimore, Md 21201

Timing: Fiscal Year 2000; Project Start 1-JUL-1998; Project End 1-JUN-2001

Summary: Clinical trials of live attenuated *Shigella* strains administered orally at the CVD protected only a minority of vaccinees from shigellosis upon challenge with wild-type. In a follow up study, these volunteers were re-challenged. Most of these who had been exposed to wild-type *Shigella* were protected from the symptoms of the disease. This study confirms field evidence in suggesting that protection can be conferred by exposure to *Shigella*. The presence of antibodies to *Shigella* measured in these volunteers did not correlate with resistance to illness following challenge. It is well established that cell-mediated immunity is the key to protection against many intracellular pathogens, including bacteria. Recent studies have suggested that cell mediated immunity may play a significant role in combating shigellosis. The goal of this research is to assess whether systemic cell mediated immunity correlates with protection from shigellosis. If such a parameter is found it will considerably enhance our understanding of the mechanisms underlying protection in shigellosis and the development of *Shigella* vaccines. Specifically, using peripheral blood mononuclear cells (PBMC) obtained from volunteers immunized with both wild-type and attenuated strains

of *S. flexneri* 2a, we propose to: (1) Test the hypothesis that inoculation of volunteers with attenuated strains or wild-type *S. flexneri* 2a elicits the appearance in circulation of specific cytotoxic T lymphocyte responses (CTL). If CTL activity is indeed observed, we will test the hypothesis that this immune response is mediated by CD8+ cells and that it is restricted by class I MHC molecules. (2) Test the hypothesis that, in addition to CTL responses, inoculation of volunteers with attenuated strains or wild-type *S. flexneri* 2a elicits the appearance in circulation of specific T lymphocytes that proliferate and produce interferon-gamma (and type-1" cytokines) in response to *Shigella* antigens. If proliferative and/or cytokine responses are observed, we will test the hypothesis that these immune response are mediated by CD4+ cells and are restricted by class II MHC molecules. (3) Test the hypothesis that CTL responses and/or interferon-gamma production correlates with protection to challenge with virulent *Shigella* strains by correlating these immune effector mechanisms with protection in volunteers challenged with wild-type *S. flexneri* 2a. (4) Determine whether protective epitopes can be identified in *Shigella* antigens by studying the fine antigen specificity of T cell clones derived from PBMC obtained from volunteers that were protected or non-protected after challenge with wild-type *S. flexneri* 2a.

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

- **Project Title: Role of Human Milk in Infant Nutrition and Health**

Principal Investigator & Institution: Morrow, Ardythe L.; Associate Professor; Pediatrics; Eastern Virginia Med Sch/Med Col Hamp Rd of Medical Coll of Hampton Road Norfolk, Va 23501

Timing: Fiscal Year 2001; Project Start 1-JUL-1979; Project End 1-AUG-2001

Summary: The competitive renewal of our program project grant application is submitted by investigators who propose to continue their studies on the unique properties of human milk. All projects address the biologic consequences through protocols which utilize in vitro assays, animal models, and humans. The projects generally seek to define and characterize factors in human milk that protect newborn infants from disease. Certain consequences of the luminal milk gastrointestinal tract interactions that pertain to protection of the infant will continue to be examined. Animal models will be utilized with study of human subjects is not possible, but human infants will be studied whenever appropriate. The respective projects and subcontracts will consider: 1) the role of soluble milk factors in the prevention of shigellosis; 2) the anti-inflammatory characteristics of human milk; 3) the role of the secretory immune system in viral enteric pathogen infection; 4) isolation,

characterization and testing of the protective factor(s) in human milk against heat-stable enterotoxin of *E. coli*; and 5) the role of human milk in the prevention of *Campylobacter* infection. Each of the projects will be supported by epidemiology/statistical, biochemical, and molecular biology core sections.

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

- **Project Title: Shiga-like Toxin--Pathogenesis in Diarrhea and HUS**

Principal Investigator & Institution: Donohue-Rolfe, Arthur; None; Tufts University Boston 136 Harrison Ave Boston, Ma 02111

Timing: Fiscal Year 1999; Project Start 0-SEP-1996; Project End 1-AUG-2002

Summary: Shigellosis is a world wide disease producing significant morbidity and in developing countries, a leading cause of diarrheal disease mortality. The *Shigella* species which causes the severest disease, dysenteriae, produces a potent toxin molecule which inhibits protein synthesis. The toxin consists of one A chain and 5 B chains. A functional role of the B chain is to mediate toxin binding to the eukaryotic cell surface. The toxin receptors are glycolipids containing terminal Gal-alpha1->4Gal disaccharide. Shiga toxin is now considered to be the prototype of a family of toxins which have been called Shiga-like. Shiga and Shiga-like toxins are associated with many clinical manifestations including diarrhea, dysentery, hemorrhagic colitis, and the hemolytic uremic syndrome. This proposal is designed to study basic structure-function relationship of the toxin B chain. A monoclonal antibody which cross-reacts with the B chain of Shiga and Shiga-like toxin II will be characterized. Since these two toxins are thought to be immunologically distinct and since the two bind to an identical set of receptors, particular attention will be focused on whether this antibody is directed against the binding domain. A monoclonal antibody and a glycoprotein with Gal-alpha1->4Gal terminal disaccharide, P1-glycoprotein, will be used as tools to select bacterial strains which produce B subunits with binding domain alterations. The characterization of these mutants will provide an understanding of the regions of the B chain involved in receptor recognition. This information will be useful for the future design of safe and effective vaccines and for the potential design of therapeutic intervention regimens. Additionally the biochemical and genetic characterization of a material which cross- reacts with antibody against Shiga toxin will be undertaken with particular emphasis on revealing the role this material may play in pathogenesis. Finally, the uncharacterized cytotoxins produced by other Gram-negative organisms will be analyzed for their Shiga-like properties. Information as to whether other

pathogenic bacteria produce Shiga-like toxins will aid in our understanding of the spectrum of disease associated with toxin.

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

- **Project Title: Shigella**

Principal Investigator & Institution: Cleary, Thomas G.; ; Eastern Virginia Med Sch/Med Col Hamp Rd of Medical Coll of Hampton Road Norfolk, Va 23501

Timing: Fiscal Year 2000

Summary: Human milk provides antibodies and non-antibody factors that may account for breast feeding protecting from symptomatic shigellosis. Virulence mechanisms of *Shigella* spp are shared with other enteropathogens. This proposal addresses the relationship between shared mechanisms of virulence and human milk factors that interact with these shared factors. We hypothesize that human milk factors which protect against *Shigella* spp. also provides protection against other enteropathogens that express related virulence proteins. The specific aims address both sigA and non IgA protective factors. Aim 1. Define the role of anti-invasion plasmid antigen [anti-IPA] antibodies in protection from shigellosis by determining the relationship between quantity of milk antibodies to baculovirus expressed recombinant IpaB, IpaC and IpaD in human milk and symptom status of breast-fed infants who become infected with *Shigella* spp. Aim 2. Define the role of cross protective anti-Ipa sigA by characterizing human milk antibodies directed toward invasion plasmid antigen epitopes shared by *Shigella* spp., invasive *E. coli* (EIEC) and *Salmonella* spp. Aim 3. Define the role of human milk antibodies to shigatoxin produced by *S. dysenteriae* serotype 1 by characterizing the ability of isolated affinity purified anti-B subunit sIgA derived from human milk to block toxin-induced HeLa cell cytotoxicity and accumulation of hemorrhagic fluid in rabbit ileal loops. Aim 4. Determine the role of non-antibody milk factors (anti-inflammatory [cytokine binding] factors, lactoferrin, shigatoxin-binding glycolipids) which interact with *Shigella* spp. virulence factors in tissue culture (HeLa cell invasion) and animal models (rabbit enteritis and rabbit ligated ileal loop) of pathogenesis.

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

E-Journals: PubMed Central¹⁸

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).¹⁹ Access to this growing archive of e-journals is free and unrestricted.²⁰ To search, go to <http://www.pubmedcentral.nih.gov/index.html#search>, and type "shigellosis" (or synonyms) into the search box. This search gives you access to full-text articles. The following is a sample of items found for shigellosis in the PubMed Central database:

- **"Black holes" and bacterial pathogenicity: A large genomic deletion that enhances the virulence of *Shigella* spp. and enteroinvasive *Escherichia coli*** by Anthony T. Maurelli, Reinaldo E. Fernandez, Craig A. Bloch, Christopher K. Rode, and Alessio Fasano; 1998 March 31
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=19942>
- **Altering Trends in the Dominance of *Shigella flexneri* Serotypes and Emergence of Serologically Atypical *S. flexneri* Strains in Dhaka, Bangladesh** by Kaisar A. Talukder, Dilip K. Dutta, Ashrafus Safa, M. Ansaruzzaman, Ferdaus Hassan, Khorshed Alam, K. M. N. Islam, N. I. A. Carlin, G. B. Nair, and David A. Sack; 2001 October
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=88427&rendertype=external>
- **An Untypeable *Shigella flexneri* Strain Associated with an Outbreak in California** by Rosalie T. Trevejo, Sharon L. Abbott, Mitchell I. Wolfe, Jerry Meshulam, David Yong, and George R. Flores; 1999 July
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=85161&rendertype=external>
- **Clonal Relationships among *Shigella* Serotypes Suggested by Cryptic Flagellin Gene Polymorphism** by Roney S. Coimbra, Martine Lefevre, Francine Grimont, and Patrick A. D. Grimont; 2001 February
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=87795&rendertype=external>

¹⁸ Adapted from the National Library of Medicine:

<http://www.pubmedcentral.nih.gov/about/intro.html>.

¹⁹ 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.

²⁰ 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.

- **Identification of *Shigella flexneri* Subserotype 1c in Rural Egypt** by Atef El-Gendy, Nemat El-Ghorab, Edward M. Lane, Remon Abu Elyazeed, Nils I. A. Carlin, Mary M. Mitry, Bradford A. Kay, Stephen J. Savarino, and Leonard F. Peruski, Jr.; 1999 March
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=84593&rendertype=external>
- **Molecular and Phenotypic Characterization of Potentially New *Shigella dysenteriae* Serotype** by Roney S. Coimbra, Pascal Lenormand, Francine Grimont, Philippe Bouvet, Shigeru Matsushita, and Patrick A. D. Grimont; 2001 February
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=87786&rendertype=external>
- **Molecular Epidemiology of a *Shigella flexneri* Outbreak in a Mountainous Township in Taiwan, Republic of China** by Chien-Shun Chiou, Wen-Bin Hsu, Hsiao-Lun Wei, and Jiann-Hwa Chen; 2001 March
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=87872&rendertype=external>
- **Multiple independent origins of *Shigella* clones of *Escherichia coli* and convergent evolution of many of their characteristics** by Gulietta M. Pupo, Ruiting Lan, and Peter R. Reeves; 2000 September 12
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=27065>
- **Prevalence of *Shigella* Enterotoxins 1 and 2 among *Shigella* Strains Isolated from Patients with Traveler's Diarrhea** by Martha Vargas, Joaquim Gascon, Maria Teresa Jimenez De Anta, and Jordi Vila; 1999 November
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=85705&rendertype=external>
- **Protein conjugates of synthetic saccharides elicit higher levels of serum IgG lipopolysaccharide antibodies in mice than do those of the O-specific polysaccharide from *Shigella dysenteriae* type 1** by Vince Pozsgay, Chiayung Chu, Lewis Pannell, Jennifer Wolfe, John B. Robbins, and Rachel Schneerson; 1999 April 27
<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=21840>

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.²¹ 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 shigellosis, simply go to the PubMed Web site at www.ncbi.nlm.nih.gov/pubmed. Type “shigellosis” (or synonyms) into the search box, and click “Go.” The following is the type of output you can expect from PubMed for “shigellosis” (hyperlinks lead to article summaries):

- **Enteric protein loss and intestinal permeability changes in children during acute shigellosis and after recovery: effect of zinc supplementation.**

Author(s): Alam AN, Sarker SA, Wahed MA, Khatun M, Rahaman MM.

Source: Gut. 1994 December; 35(12): 1707-11.

http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=7829006&dopt=Abstract

- **Evaluation of indigenous plants in the treatment of acute shigellosis.**

Author(s): Haider R, Khan AK, Aziz KM, Chowdhury A, Kabir I.

Source: Trop Geogr Med. 1991 July; 43(3): 266-70.

http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1816661&dopt=Abstract

Vocabulary Builder

Analogous: Resembling or similar in some respects, as in function or appearance, but not in origin or development;. [EU]

Antibody: An immunoglobulin molecule that has a specific amino acid sequence by virtue of which it interacts only with the antigen that induced its synthesis in cells of the lymphoid series (especially plasma cells), or with antigen closely related to it. Antibodies are classified according to their mode of action as agglutinins, bacteriolysins, haemolysins, opsonins, precipitins,

²¹ 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.

etc. [EU]

Antigen: Any substance which is capable, under appropriate conditions, of inducing a specific immune response and of reacting with the products of that response, that is, with specific antibody or specifically sensitized T-lymphocytes, or both. Antigens may be soluble substances, such as toxins and foreign proteins, or particulate, such as bacteria and tissue cells; however, only the portion of the protein or polysaccharide molecule known as the antigenic determinant (q.v.) combines with antibody or a specific receptor on a lymphocyte. Abbreviated Ag. [EU]

Aqueous: Watery; prepared with water. [EU]

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

Atypical: Irregular; not conformable to the type; in microbiology, applied specifically to strains of unusual type. [EU]

Bacillus: A genus of bacteria of the family Bacillaceae, including large aerobic or facultatively anaerobic, spore-forming, rod-shaped cells, the great majority of which are gram-positive and motile. The genus is separated into 48 species, of which three are pathogenic, or potentially pathogenic, and the remainder are saprophytic soil forms. Many organisms historically called *Bacillus* are now classified in other genera. [EU]

Bacteremia: The presence of viable bacteria circulating in the blood. Fever, chills, tachycardia, and tachypnea are common acute manifestations of bacteremia. The majority of cases are seen in already hospitalized patients, most of whom have underlying diseases or procedures which render their bloodstreams susceptible to invasion. [NIH]

Biochemical: Relating to biochemistry; characterized by, produced by, or involving chemical reactions in living organisms. [EU]

Colitis: Inflammation of the colon. [EU]

Concomitant: Accompanying; accessory; joined with another. [EU]

Cytokines: Non-antibody proteins secreted by inflammatory leukocytes and some non-leukocytic cells, that act as intercellular mediators. They differ from classical hormones in that they are produced by a number of tissue or cell types rather than by specialized glands. They generally act locally in a paracrine or autocrine rather than endocrine manner. [NIH]

Cytoplasm: The protoplasm of a cell exclusive of that of the nucleus; it consists of a continuous aqueous solution (cytosol) and the organelles and inclusions suspended in it (phaneroplasm), and is the site of most of the chemical activities of the cell. [EU]

Cytotoxic: Pertaining to or exhibiting cytotoxicity. [EU]

Cytotoxins: Substances elaborated by microorganisms, plants or animals that are specifically toxic to individual cells; they may be involved in immunity or may be contained in venoms. [NIH]

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

Diphtheria: A localized infection of mucous membranes or skin caused by toxigenic strains of *Corynebacterium diphtheriae*. It is characterized by the presence of a pseudomembrane at the site of infection. Diphtheria Toxin, produced by *C. diphtheriae*, can cause myocarditis, polyneuritis, and other systemic toxic effects. [NIH]

Dominance: In genetics, the full phenotypic expression of a gene in both heterozygotes and homozygotes. [EU]

Endemic: Present or usually prevalent in a population or geographical area at all times; said of a disease or agent. Called also endemial. [EU]

Enterotoxins: Substances that are toxic to the intestinal tract causing vomiting, diarrhea, etc.; most common enterotoxins are produced by bacteria. [NIH]

Enzyme: A protein molecule that catalyses chemical reactions of other substances without itself being destroyed or altered upon completion of the reactions. Enzymes are classified according to the recommendations of the Nomenclature Committee of the International Union of Biochemistry. Each enzyme is assigned a recommended name and an Enzyme Commission (EC) number. They are divided into six main groups; oxidoreductases, transferases, hydrolases, lyases, isomerases, and ligases. [EU]

Epidemiological: Relating to, or involving epidemiology. [EU]

Epithelium: The covering of internal and external surfaces of the body, including the lining of vessels and other small cavities. It consists of cells joined by small amounts of cementing substances. Epithelium is classified into types on the basis of the number of layers deep and the shape of the superficial cells. [EU]

Epitopes: Sites on an antigen that interact with specific antibodies. [NIH]

Extracellular: Outside a cell or cells. [EU]

Flagellin: A protein with a molecular weight of 40,000 isolated from bacterial flagella. At appropriate pH and salt concentration, three flagellin monomers can spontaneously reaggregate to form structures which appear identical to intact flagella. [NIH]

Fluorescence: The property of emitting radiation while being irradiated. The radiation emitted is usually of longer wavelength than that incident or absorbed, e.g., a substance can be irradiated with invisible radiation and emit visible light. X-ray fluorescence is used in diagnosis. [NIH]

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

Gelsolin: A 90-kD protein produced by macrophages that severs actin filaments and forms a cap on the newly exposed filament end. Gelsolin is activated by calcium ions and participates in the assembly and disassembly of actin, thereby increasing the motility of some cells. [NIH]

Homologous: Corresponding in structure, position, origin, etc., as (a) the feathers of a bird and the scales of a fish, (b) antigen and its specific antibody, (c) allelic chromosomes. [EU]

Humoral: Of, relating to, proceeding from, or involving a bodily humour - now often used of endocrine factors as opposed to neural or somatic. [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]

Immunotoxins: Semisynthetic conjugates of various toxic molecules, including radioactive isotopes and bacterial or plant toxins, with specific immune substances such as immunoglobulins, monoclonal antibodies, and antigens. The antitumor or antiviral immune substance carries the toxin to the tumor or infected cell where the toxin exerts its poisonous effect. [NIH]

Induction: The act or process of inducing or causing to occur, especially the production of a specific morphogenetic effect in the developing embryo through the influence of evocators or organizers, or the production of anaesthesia or unconsciousness by use of appropriate agents. [EU]

Inflammation: A pathological process characterized by injury or destruction of tissues caused by a variety of cytologic and chemical reactions. It is usually manifested by typical signs of pain, heat, redness, swelling, and loss of function. [NIH]

Intoxication: Poisoning, the state of being poisoned. [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]

Localization: 1. the determination of the site or place of any process or lesion. 2. restriction to a circumscribed or limited area. 3. prelocalization. [EU]

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

Meningitis: Inflammation of the meninges. When it affects the dura mater, the disease is termed pachymeningitis; when the arachnoid and pia mater are involved, it is called leptomeningitis, or meningitis proper. [EU]

Motility: The ability to move spontaneously. [EU]

Neutrophil: Having an affinity for neutral dyes. [EU]

Pathogen: Any disease-producing microorganism. [EU]

Pediatrics: A medical specialty concerned with maintaining health and providing medical care to children from birth to adolescence. [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]

Pseudomonas: A genus of gram-negative, aerobic, rod-shaped bacteria widely distributed in nature. Some species are pathogenic for humans, animals, and plants. [NIH]

Quercetin: Aglucon of quercetrin, rutin, and other glycosides. It is widely distributed in the plant kingdom, especially in rinds and barks, clover blossoms, and ragweed pollen. [NIH]

Reagent: A substance employed to produce a chemical reaction so as to detect, measure, produce, etc., other substances. [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]

Recombinant: 1. a cell or an individual with a new combination of genes not found together in either parent; usually applied to linked genes. [EU]

Reconstitution: 1. a type of regeneration in which a new organ forms by the rearrangement of tissues rather than from new formation at an injured surface. 2. the restoration to original form of a substance previously altered for preservation and storage, as the restoration to a liquid state of blood serum or plasma that has been dried and stored. [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]

Secretion: 1. the process of elaborating a specific product as a result of the activity of a gland; this activity may range from separating a specific substance of the blood to the elaboration of a new chemical substance. 2. any substance produced by secretion. [EU]

Serum: The clear portion of any body fluid; the clear fluid moistening serous membranes. 2. blood serum; the clear liquid that separates from blood on clotting. 3. immune serum; blood serum from an immunized animal used for passive immunization; an antiserum; antitoxin, or antivenin. [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]

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 allaying of symptoms, as symptomatic treatment. [EU]

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

Vinculin: A cytoskeletal protein associated with cell-cell and cell-matrix interactions. The amino acid sequence of human vinculin has been determined. The protein consists of 1066 amino acid residues and its gene has been assigned to chromosome 10. [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]

CHAPTER 4. BOOKS ON SHIGELLOSIS

Overview

This chapter provides bibliographic book references relating to shigellosis. You have many options to locate books on shigellosis. 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 shigellosis 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 directly to the following hyperlink: **<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 "shigellosis" (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 shigellosis:

- **1997 Red Book: Report of the Committee on Infectious Diseases. 24th ed**

Source: Elk Grove Village, IL: American Academy of Pediatrics. 1997. 764 p.

Contact: Available from American Academy of Pediatrics. Publications, P.O. Box 747, Elk Grove Village, IL 60009-0747. (800) 433-9016 or (847) 228-5005. Fax (847) 228-1281. E-mail: pubs@aap.org. PRICE: Single copy free to members, with additional copies \$74.95 each; \$79.95 for nonmembers. ISBN: 091076185x. Publication number MA0001.

Summary: This monograph contains the 24th edition of the report of the Committee on Infectious Diseases, the group responsible for formulating and revising guidelines of the American Academy of Pediatrics for the control of infectious diseases in children. Five sections present guidelines in the areas of active and passive immunization; recommendations for the care of children in special circumstances, including children in day care, infection control for hospitalized children, and medical evaluation of internationally adopted children; summaries of infectious diseases; antimicrobial prophylaxis; and antimicrobials and related therapy. Infectious diseases that can affect the digestive system include amebiasis, campylobacter infections, cholera, *Escherichia coli*, diarrhea, giardia lamblia, helicobacter pylori, hepatitis, HIV, malaria, parasitic diseases, salmonellosis, schistosomiasis, shigellosis, vibrio infections, and yersinia infections. A summary of major changes in the 1997 edition is provided; changes include the addition of recent information on *Escherichia coli* diarrhea (E coli 0157:H7 infection) and its complication of hemolytic-uremic syndrome, and expanded information about Hepatitis A, B, and C. A subject index concludes the volume. 9 appendices.

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 following have been recently listed with online booksellers as relating to shigellosis (sorted alphabetically by title; follow the hyperlink to view more details at Amazon.com):

- **Pathogenesis of Shigellosis (Current Topics in Microbiology and Immunology, No 180)** by P.J. Sansonetti (Editor), et al; ISBN: 0387550585; <http://www.amazon.com/exec/obidos/ASIN/0387550585/icongroupinterna>

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 "shigellosis" (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:²²

- **Development of vaccines against shigellosis.** ; Year: 1986; 1986
- **Final report. Republic of Kenya Diarrhoeal Diseases Household Case Management Survey.** Author: Sudirdjo, Raden Gambiro Prawiro, 1915-; Year: 1990; Nairobi, Kenya, Ministry of Health, 1990
- **Intervention of shigellosis by hand washing.** Author: M. Khan ... [et al.]; Year: 1981; Dacca, International Centre for Diarrhoeal Disease Research, Bangladesh, 1981
- **Pathogenesis of shigellosis.** Author: edited by P.J. Sansonetti; Year: 1992; Berlin; New York: Springer-Verlag, c1992; ISBN: 3540550585 (alk. paper)
- **Shigellosis, a continuing global problem: proceedings of an international conference, Cox's Bazaar, Bangladesh, June 15-20, 1981; organized by [the] International Centre for Diarrhoeal Disease Research, Bangladesh.** Author: editors, M. Mujibur Rahaman ... [et al.]; Year: 1983; Bangladesh: The Centre, 1983

²² 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>.

- **Socio-hygienic survey during an epidemic of shigellosis in a rural area of central Java (Pemalang regency).** Author: door Raden Gambiro Prawiro Sudirdjo; Year: 1968; [Leiden?: s.n., 1968?]

Chapters on Shigellosis

Frequently, shigellosis will be discussed within a book, perhaps within a specific chapter. In order to find chapters that are specifically dealing with shigellosis, an excellent source of abstracts is the Combined Health Information Database. You will need to limit your search to book chapters and shigellosis 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 "shigellosis" (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 shigellosis:

- **Routes of Transmission of Pathogenic Microorganisms**

Source: in Joneja, J.M. and Bielory, L. Understanding Allergy, Sensitivity, and Immunity: A Comprehensive Guide. New Brunswick, NJ: Rutgers University Press. 1990. p. 20-25.

Contact: Available from Rutgers University Press. 109 Church Street, New Brunswick, NJ 08901. (201) 932-7037. PRICE: \$35 (cloth) or \$13.95 (paperback). ISBN: 0813515203 (cloth) or 0813515211 (paperback).

Summary: This chapter, from a comprehensive guide to understanding allergy, sensitivity, and immunity, discusses the routes of transmission of pathogenic microorganisms, notably the digestive route. Microorganisms in food, water, and other beverages are introduced into the digestive tract during eating and drinking. They may cause infections of the alimentary system alone or in other organ systems after dissemination from the initial infection site. Cholera, typhoid fever, and shigellosis are intestinal infections caused by bacteria that can be transmitted in contaminated water supplies. Hepatitis A virus can be transmitted in the same manner. Escherichia coli, a normal inhabitant of the healthy intestinal tract, but which can cause gastroenteritis, is commonly present in water contaminated with feces. The authors also discuss the variety of ways that food can be contaminated.

General Home References

In addition to references for shigellosis, 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: Today's 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

Alimentary: Pertaining to food or nutritive material, or to the organs of digestion. [EU]

Amebiasis: Infection with any of various amebae. It is an asymptomatic carrier state in most individuals, but diseases ranging from chronic, mild diarrhea to fulminant dysentery may occur. [NIH]

Helicobacter: A genus of gram-negative, spiral-shaped bacteria that is

pathogenic and has been isolated from the intestinal tract of mammals, including humans. [NIH]

Hygienic: Pertaining to hygiene, or conducive to health. [EU]

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

Prophylaxis: The prevention of disease; preventive treatment. [EU]

Vibrio: A genus of vibronaceae, 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]

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

CHAPTER 5. MULTIMEDIA ON SHIGELLOSIS

Overview

Information on shigellosis 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 shigellosis. 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.

Bibliography: Multimedia on Shigellosis

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 shigellosis (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 shigellosis. For more information, follow the hyperlink indicated:

- **Isolation and identification of shigellae.** Source: a National Medical Audiovisual Center production; [presented by] the U.S. Department of Health, Education, and Welfare, Public Health Service; Year: 1968; Format: Motion picture; United States: The Center, 1968

- **Medical terminology: gastroenterological disorders and surgery.** Source: Au-Vid, inc; Year: 1975; Format: Sound recording; [Garden Grove, Calif.]: Au-Vid, [1975]
- **Salmonellosis, shigellosis and antibiotics.** Source: Emory University School of Medicine; Year: 1975; Format: Videorecording; Atlanta: Georgia Regional Medical Television Network: [for loan or sale by A. W. Calhoun Medical Library], 1975

CHAPTER 6. 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.²³ 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:²⁴

- **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

²³ Remember, for the general public, the National Library of Medicine recommends the databases referenced in MEDLINEplus (<http://medlineplus.gov/> or <http://www.nlm.nih.gov/medlineplus/databases.html>).

²⁴ See <http://www.nlm.nih.gov/databases/databases.html>.

- **Cancer Information:** Access to cancer-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 shigellosis, the following are particularly noteworthy.

The Combined Health Information Database

A comprehensive source of information on clinical guidelines written for professionals is the Combined Health Information Database. You will need to limit your search to “Brochure/Pamphlet,” “Fact Sheet,” or “Information Package” and shigellosis using the “Detailed Search” option. Go directly to the following hyperlink: <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 the publication date, select “All Years,” select your preferred language, and the format option “Fact Sheet.” By making these selections and typing “shigellosis” (or synonyms) into the “For

these words:" box above, you will only receive results on fact sheets dealing with shigellosis. The following is a sample result:

- **Shigellosis in Child Day Care Centers-Lexington-Fayette County, Kentucky, 1991**

Source: MMWR. Morbidity and Mortality Weekly Report. 41(25): 440-442. June 26, 1992.

Summary: In January 1991, the Lexington-Fayette County (Kentucky) Health Department (LFCHD) received three reports of *Shigella sonnei* infections from the University of Kentucky microbiology laboratory. The infections occurred in children aged 2-3 years, each of whom attended a different child day care center. This report summarizes the findings of an investigation by the LFCHD and the Kentucky Department for Health Services to assess the impact of day care center attendance on communitywide shigellosis. Despite health education efforts and follow-up by LFCHD, cases continued to occur with a total of 186 culture-confirmed *S. sonnei* infections by July 15, 1991. The authors also report that, to control shigellosis, in June 1991, FLCHD created a *Shigella* task force that instituted a diarrhea clinic to facilitate proper diagnosis and treatment, intensified infection-control training and surveillance for shigellosis, and encouraged community-based participation in prevention efforts. 10 references.

The NLM Gateway²⁵

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.²⁶ One target audience 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.²⁷ To use the NLM Gateway, simply go to the search site at

²⁵ Adapted from NLM: <http://gateway.nlm.nih.gov/gw/Cmd?Overview.x>.

²⁶ 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).

²⁷ 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

<http://gateway.nlm.nih.gov/gw/Cmd>. Type “shigellosis” (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	344613
Books / Periodicals / Audio Visual	2564
Consumer Health	292
Meeting Abstracts	3093
Other Collections	100
Total	350662

HSTAT²⁸

HSTAT is a free, Web-based resource that provides access to full-text documents used in healthcare decision-making.²⁹ 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 AHRQ’s Put Prevention Into Practice.³⁰ Simply search by “shigellosis” (or synonyms) at the following Web site: <http://text.nlm.nih.gov>.

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.

²⁸ Adapted from HSTAT: <http://www.nlm.nih.gov/pubs/factsheets/hstat.html>.

²⁹ The HSTAT URL is <http://hstat.nlm.nih.gov/>.

³⁰ 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*

Coffee Break: Tutorials for Biologists³¹

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.³² 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.³³ 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 the following hyperlink: <http://www.ncbi.nlm.nih.gov/Coffeebreak/>.

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/clinweb/>.
- **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/>.

Services; and the Health Technology Advisory Committee (HTAC) of the Minnesota Health Care Commission (MHCC) health technology evaluations.

³¹ Adapted from <http://www.ncbi.nlm.nih.gov/Coffeebreak/Archive/FAQ.html>.

³² 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.

³³ 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.

- **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 shigellosis (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>

CHAPTER 7. DISSERTATIONS ON SHIGELLOSIS

Overview

University researchers are active in studying almost all known diseases. The result of research is often published in the form of Doctoral or Master's dissertations. You should understand, therefore, that applied diagnostic procedures and/or therapies can take many years to develop after the thesis that proposed the new technique or approach was written.

In this chapter, we will give you a bibliography on recent dissertations relating to shigellosis. You can read about these in more detail using the Internet or your local medical library. We will also provide you with information on how to use the Internet to stay current on dissertations.

Dissertations on Shigellosis

ProQuest Digital Dissertations is the largest archive of academic dissertations available. From this archive, we have compiled the following list covering dissertations devoted to shigellosis. You will see that the information provided includes the dissertation's title, its author, and the author's institution. To read more about the following, simply use the Internet address indicated. The following covers recent dissertations dealing with shigellosis:

- **Cultural Factors Related to the Epidemiology of Viral Hepatitis in a Southwestern United States County (infectious Disease, Socioeconomic, Public Health, Behavior, Communicable)** by McCombie, Susan Carole, Phd from The University of Arizona, 1986, 184 pages
<http://wwwlib.umi.com/dissertations/fullcit/8613437>

Keeping Current

As previously mentioned, an effective way to stay current on dissertations dedicated to shigellosis is to use the database called *ProQuest Digital Dissertations* via the Internet, located at the following Web address: **<http://wwwlib.umi.com/dissertations>**. The site allows you to freely access the last two years of citations and abstracts. Ask your medical librarian if the library has full and unlimited access to this database. From the library, you should be able to do more complete searches than with the limited 2-year access available to the general public.

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 shigellosis 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 shigellosis. 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 shigellosis. Research can give you information on the side effects, interactions, and limitations of prescription drugs used in the treatment of shigellosis. 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 Basics³⁴

The Agency for Health Care Research and Quality has published extremely useful guidelines on how you can best participate in the medication aspects of shigellosis. 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 shigellosis 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:

³⁴ This section is adapted from AHCRQ: <http://www.ahcpr.gov/consumer/ncpiebro.htm>.

- 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 shigellosis. 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.
- 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 shigellosis). 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 shigellosis. 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.³⁵

While the FDA database is rather large and difficult to navigate, the Pharmacopeia 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.

Of course, we as editors cannot be certain as to what medications you are taking. Therefore, we have compiled a list of medications associated with the treatment of shigellosis. Once again, due to space limitations, we only list a sample of medications and provide hyperlinks to ample documentation (e.g. typical dosage, side effects, drug-interaction risks, etc.). The following drugs have been mentioned in the Pharmacopeia and other sources as being potentially applicable to shigellosis:

Chloramphenicol

- **Systemic - U.S. Brands:** Chloromycetin
<http://www.nlm.nih.gov/medlineplus/druginfo/chloramphenicolsystemic202127.html>

Ciprofloxacin

- **Ophthalmic - U.S. Brands:** Ciloxan
<http://www.nlm.nih.gov/medlineplus/druginfo/ciprofloxacinophthalmic202655.html>

Tetracycline Periodontal Fibers

- **Dental - U.S. Brands:** Actisite
<http://www.nlm.nih.gov/medlineplus/druginfo/tetracyclineperiodontalfibersd202729.html>

³⁵ Though cumbersome, the FDA database can be freely browsed at the following site: www.fda.gov/cder/da/da.htm.

Tetracyclines

- **Dental - U.S. Brands:**
<http://www.nlm.nih.gov/medlineplus/druginfo/tetracyclineperiodontalfibersd202729.html>
- **Systemic - U.S. Brands:** Achromycin V; Declomycin; Doryx; Dynacin; Minocin; Monodox; Terramycin; Vibramycin; Vibra-Tabs
<http://www.nlm.nih.gov/medlineplus/druginfo/tetracyclinessystemic202552.html>
- **Topical - U.S. Brands:** Achromycin; Aureomycin; Meclan; Topicycline
<http://www.nlm.nih.gov/medlineplus/druginfo/tetracyclinetopical202553.html>

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.

Reuters Health Drug Database

The Reuters Health Drug Database can be searched by keyword at the hyperlink: <http://www.reutershealth.com/frame2/drug.html>. The following medications are listed in the Reuters' database as associated with shigellosis (including those with contraindications):³⁶

- **Trimethoprim Sulfamethoxazole**
http://www.reutershealth.com/atoz/html/Trimethoprim_Sulfamethoxazole.htm

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>.

³⁶ Adapted from *A to Z Drug Facts* by Facts and Comparisons.

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 shigellosis--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 shigellosis or potentially create deleterious side effects in patients with shigellosis. 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 shigellosis. 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 shigellosis. The FDA warns patients to watch out for³⁷:

- Secret formulas (real scientists share what they know)
- 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**.

³⁷ This section has been adapted from <http://www.fda.gov/opacom/lowlit/medfraud.html>.

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>

Vocabulary Builder

The following vocabulary builder gives definitions of words used in this chapter that have not been defined in previous chapters:

Ophthalmic: Pertaining to the eye. [EU]

Topical: Pertaining to a particular surface area, as a topical anti-infective applied to a certain area of the skin and affecting only the area to which it is applied. [EU]

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 shigellosis. Finally, at the conclusion of this chapter, we will provide a list of readings on shigellosis 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 or Complementary 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 Shigellosis

Having read the previous discussion, you may be wondering which complementary or alternative treatments might be appropriate for shigellosis. 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 shigellosis 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 "shigellosis" (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 shigellosis:

- **Absorption of macronutrients and nitrogen balance in children with dysentery fed an amylase-treated energy-dense porridge.**
Author(s): Rahman MM, Mahalanabis D, Ali M, Mazumder RN, Wahed MA, Fuchs GJ.

Source: Acta Paediatrica (Oslo, Norway : 1992). 1997 December; 86(12): 1312-6.

http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9475307&dopt=Abstract

- **Efficacy of aqueous extract of garlic & allicin in experimental shigellosis in rabbits.**

Author(s): Chowdhury AK, Ahsan M, Islam SN, Ahmed ZU.

Source: The Indian Journal of Medical Research. 1991 January; 93: 33-6.

http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=2022399&dopt=Abstract

- **Enteric protein loss and intestinal permeability changes in children during acute shigellosis and after recovery: effect of zinc supplementation.**

Author(s): Alam AN, Sarker SA, Wahed MA, Khatun M, Rahaman MM.

Source: Gut. 1994 December; 35(12): 1707-11.

http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=7829006&dopt=Abstract

- **Evaluation of indigenous plants in the treatment of acute shigellosis.**

Author(s): Haider R, Khan AK, Aziz KM, Chowdhury A, Kabir I.

Source: Trop Geogr Med. 1991 July; 43(3): 266-70.

http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=1816661&dopt=Abstract

- **Microbiological screening of Indian medicinal plants with special reference to enteropathogens.**

Author(s): Vijaya K, Ananthan S.

Source: Journal of Alternative and Complementary Medicine (New York, N.Y.). 1997 Spring; 3(1): 13-20.

http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9395690&dopt=Abstract

- **Multi-drug-resistant Shigella infections in Fujian Province, China.**

Author(s): Ye XL, Cao YX, Xu JS, Wu KY, Shi XY.

Source: J Diarrhoeal Dis Res. 1990 September; 8(3): 99. No Abstract Available.

http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=2243184&dopt=Abstract

- **Shigelloidal properties of three Nigerian medicinal plants: *Ocimum gratissimum*, *Terminalia avicennoides*, and *Momordica balsamina*.**
 Author(s): Iwalokun BA, Gbenle GO, Adewole TA, Akinsinde KA.
 Source: J Health Popul Nutr. 2001 December; 19(4): 331-5.
http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11855356&dopt=Abstract

- **Social and behavioral factors in transmission and response to shigellosis.**
 Author(s): Kunstadter P.
 Source: Reviews of Infectious Diseases. 1991 March-April; 13 Suppl 4: S272-8. Review.
http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=2047650&dopt=Abstract

- **The effects of health services utilization on the recovery from dysentery.**
 Author(s): Myaux JA, Chakraborty J, Yunus M, Khan EH, de Francisco A.
 Source: Journal of Tropical Pediatrics. 1996 February; 42(1): 38-42.
http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8820619&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>

The following is a specific Web list relating to shigellosis; please note that any particular subject below may indicate either a therapeutic use, or a contraindication (potential danger), and does not reflect an official recommendation:

- **General Overview**

Food Poisoning

Source: Integrative Medicine Communications;
www.onemedicine.com

Hyperlink:

<http://www.drkoop.com/interactivemedicine/ConsConditions/FoodPoisoningcc.html>

- **Herbs and Supplements**

Centella

Alternative names: Gotu Kola; Centella asiatica (Linn.)

Source: Alternative Medicine Foundation, Inc.;
www.amfoundation.org

Hyperlink: <http://www.herbmed.org/>

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

The following vocabulary builder gives definitions of words used in this chapter that have not been defined in previous chapters:

Colic: Paroxysms of pain. This condition usually occurs in the abdominal region but may occur in other body regions as well. [NIH]

Nitrogen: An element with the atomic symbol N, atomic number 7, and atomic weight 14. Nitrogen exists as a diatomic gas and makes up about 78% of the earth's atmosphere by volume. It is a constituent of proteins and nucleic acids and found in all living cells. [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 shigellosis. 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 shigellosis may be given different recommendations. Some recommendations may be directly related to shigellosis, 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 shigellosis. We will then show you how to find studies dedicated specifically to nutrition and shigellosis.

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 B¹**, 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 B²**, 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 B³**, 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 B⁶**, 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 B¹²** is vital for a healthy nervous system and for the growth of red blood cells in bone marrow; food sources for vitamin B12 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.

⁴¹ Adapted from the FDA: <http://www.fda.gov/fdac/special/foodlabel/dvs.html>.

- **RDIs (Reference Daily Intakes):** A set of dietary references based on the Recommended Dietary Allowances for essential vitamins and minerals 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

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.”

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. 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 Shigellosis

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

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.

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 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 “shigellosis” (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 “shigellosis” (or a synonym):

- **Absorption of macronutrients from a calorie-dense diet in malnourished children during acute shigellosis.**
 Author(s): International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh.
 Source: Mazumder, R N Kabir, I Rahman, M M Khatun, M Mahalanabis, D J-Pediatr-Gastroenterol-Nutr. 1996 July; 23(1): 24-8 0277-2116
- **Absorption of macronutrients from a high-protein diet in children during convalescence from shigellosis.**
 Author(s): International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh.
 Source: Kabir, I Malek, M A Mahalanabis, D Rahman, M M Khatun, M Wahed, M A Majid, N J-Pediatr-Gastroenterol-Nutr. 1994 January; 18(1): 63-7 0277-2116
- **Antimicrobial therapy for shigellosis.**
 Author(s): Dhaka Treatment Center, International Center for Diarrhoeal Disease Research, Bangladesh.
 Source: Salam, M A Bennish, M L Rev-Infect-Dis. 1991 Mar-April; 13 Suppl 4S332-41 0162-0886
- **Early feeding of an energy dense diet during acute shigellosis enhances growth in malnourished children.**
 Author(s): Clinical Sciences Division, International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh.
 Source: Mazumder, R N Hoque, S S Ashraf, H Kabir, I Wahed, M A J-Nutr. 1997 January; 127(1): 51-4 0022-3166
- **Effect of an energy-dense diet on the clinical course of acute shigellosis in undernourished children.**
 Author(s): International Centre for Diarrhoeal Disease Research, Bangladesh GPO Box 128, Dhaka 1000, Bangladesh.
 rmazumder@ed.ac.uk

Source: Mazumder, R N Ashraf, H Hoque, S S Kabir, I Majid, N Wahed, M A Fuchs, G J Mahalanabis, D Br-J-Nutr. 2000 November; 84(5): 775-9 0007-1145

- **Effects of a protein-rich diet during convalescence from shigellosis on catch-up growth, serum proteins, and insulin-like growth factor-I.**

Author(s): International Centre of Diarrheal Disease Research, Bangladesh.

Source: Kabir, I Butler, T Underwood, L E Rahman, M M Pediatr-Res. 1992 December; 32(6): 689-92 0031-3998

- **Enteric protein loss and intestinal permeability changes in children during acute shigellosis and after recovery: effect of zinc supplementation.**

Author(s): International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka.

Source: Alam, A N Sarker, S A Wahed, M A Khatun, M Rahaman, M M Gut. 1994 December; 35(12): 1707-11 0017-5749

- **Epidemiology of shigellosis among children exposed to cases of Shigella dysentery: a multivariate assessment.**

Author(s): International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka, Bangladesh.

Source: Ahmed, F Clemens, J D Rao, M R Ansaruzzaman, M Haque, E Am-J-Trop-Med-Hyg. 1997 March; 56(3): 258-64 0002-9637

- **Evaluation of indigenous plants in the treatment of acute shigellosis.**

Author(s): International Centre for Diarrhoeal Disease Research, Bangladesh.

Source: Haider, R Khan, A K Aziz, K M Chowdhury, A Kabir, I Trop-Geogr-Med. 1991 July; 43(3): 266-70 0041-3232

- **Increased height gain of children fed a high-protein diet during convalescence from shigellosis: a six-month follow-Up study.**

Author(s): International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) Dhaka 1000, Bangladesh.

Source: Kabir, I Rahman, M M Haider, R Mazumder, R N Khaled, M A Mahalanabis, D J-Nutr. 1998 October; 128(10): 1688-91 0022-3166

- **Lack of reactivation of shigellosis in naturally infected enrofloxacin-treated cynomolgus monkeys after exogenous immunosuppression.**

Author(s): SmithKline Beecham Pharmaceuticals, King of Prussia, Pennsylvania 19406-0939, USA.

Source: Black Schultz, L Coatney, R W Warnick, C L Swif, B Lab-Anim-Sci. 1997 December; 47(6): 602-5 0023-6764

- **Predictors of serum retinol in children with shigellosis.**
 Author(s): Department of International Health, The University of Alabama at Birmingham, USA.
 Source: Mitra, A K Alvarez, J O Wahed, M A Fuchs, G J Stephensen, C B Am-J-Clin-Nutr. 1998 November; 68(5): 1088-94 0002-9165
- **Rapid catch-up growth of children fed a high-protein diet during convalescence from shigellosis.**
 Author(s): International Centre for Diarrheal Disease Research, Dhaka, Bangladesh.
 Source: Kabir, I Malek, M A Mazumder, R N Rahman, M M Mahalanabis, D Am-J-Clin-Nutr. 1993 March; 57(3): 441-5 0002-9165
- **Role of amylase-treated, energy-dense liquid diet in the nutritional management of acute shigellosis in children: a controlled clinical trial.**
 Author(s): Clinical Sciences Division, International Centre for Diarrhoeal Disease Research, Dhaka, Bangladesh.
 Source: Rahman, M M Mazumder, R N Ali, M Mahalanabis, D Acta-Paediatr. 1995 August; 84(8): 867-72 0803-5253
- **Short-chain fatty acids improve clinical, pathologic, and microbiologic features of experimental shigellosis.**
 Author(s): Physiology Research Centre, International Centre for Diarrhoeal Disease Research, Mohakhali, Dhaka 1000, Bangladesh. rabbani@icddr.org
 Source: Rabbani, G H Albert, M J Hamidur Rahman, A S Moyeenul Isalm, M Nasirul Islam, K M Alam, K J-Infect-Dis. 1999 February; 179(2): 390-7 0022-1899
- **Single dose vitamin A treatment in acute shigellosis in Bangladesh children: randomised double blind controlled trial.**
 Author(s): Clinical Sciences Division, International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka. shossain@icddr.org
 Source: Hossain, S Biswas, R Kabir, I Sarker, S Dibley, M Fuchs, G Mahalanabis, D BMJ. 1998 February 7; 316(7129): 422-6 0959-8138
- **Social and behavioral factors in transmission and response to shigellosis.**
 Author(s): Institute for Health Policy Studies, School of Medicine, University of California, San Francisco 94109.
 Source: Kunstadter, P Rev-Infect-Dis. 1991 Mar-April; 13 Suppl 4S272-8 0162-0886
- **The effect of dietary protein supplementation on insulin-like growth factors (IGFs) and IGF-binding proteins in children with shigellosis.**
 Author(s): Department of Pediatrics and Medicine, University of North Carolina, Chapel Hill 27599.

Source: Pucilowska, J B Davenport, M L Kabir, I Clemmons, D R Thissen, J P Butler, T Underwood, L E J-Clin-Endocrinol-Metab. 1993 December; 77(6): 1516-21 0021-972X

- **Therapeutic potential of the volatile oil of *Nigella sativa* seeds in monkey model with experimental shigellosis.**

Source: Azad Chowdhury, A.K. Islam, A. Rashid, A. Ferdous, A.J. PTR,-Phytother-res. Sussex : John Wiley & Sons Ltd. August 1998. volume 12 (5) page 361-363. 0951-418X

- **Urinary retinol excretion and kidney function in children with shigellosis.**

Author(s): Department of International Health, University of Alabama at Birmingham, USA.

Source: Mitra, A K Alvarez, J O Guay Woodford, L Fuchs, G J Wahed, M A Stephensen, C B Am-J-Clin-Nutr. 1998 November; 68(5): 1095-103 0002-9165

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]

Convalescence: The stage of recovery following an attack of disease, a

surgical operation, or an injury. [EU]

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

Exogenous: Developed or originating outside the organism, as exogenous disease. [EU]

Insulin: A protein hormone secreted by beta cells of the pancreas. Insulin plays a major role in the regulation of glucose metabolism, generally promoting the cellular utilization of glucose. It is also an important regulator of protein and lipid metabolism. Insulin is used as a drug to control insulin-dependent diabetes mellitus. [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]

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]

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

Reactivation: The restoration of activity to something that has been inactivated. [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]

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]

Thermoregulation: Heat regulation. [EU]

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

Urinary: Pertaining to the urine; containing or secreting urine. [EU]

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.lsuhscc.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 Resource 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.html#conshealth.html#
- **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.engagewoodhospital.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 shigellosis 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 network composition, the procedures that govern access to specialists and emergency services, and care management information.

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

- ***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.
- 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.

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>.

- 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 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.

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>.

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.

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.

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

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

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

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>
- Patient’s Rights, Confidentiality, Informed Consent, Ombudsman Programs, Privacy and Patient Issues:
<http://www.nlm.nih.gov/medlineplus/patientissues.html>

⁵⁵ You can access this information at:

<http://www.nlm.nih.gov/medlineplus/healthsystem.html>.

- Veteran's Health, Persian Gulf War, Gulf War Syndrome, Agent Orange:
<http://www.nlm.nih.gov/medlineplus/veteranshealth.html>

APPENDIX F. MORE ON FOOD IRRADIATION

Overview⁵⁶

Food irradiation is a promising new food safety technology that can eliminate disease-causing germs from foods. Like pasteurization of milk, and pressure cooking of canned foods, treating food with ionizing radiation can kill bacteria and parasites that would otherwise cause foodborne disease. Similar technology is used to sterilize medical devices so they can be used in surgery or implanted without risk of infection. The food that NASA astronauts eat has been sterilized by irradiation to avoid getting foodborne illness in space. The effects of irradiation on the food and on animals and people eating irradiated food have been studied extensively. These studies show clearly that when irradiation is used as approved on foods:

- Disease-causing germs are reduced or eliminated
- Food does not become radioactive
- Dangerous substances do not appear in the foods
- Nutritional value of the food is essentially unchanged

Irradiation is a safe and effective technology that can prevent many foodborne diseases.

⁵⁶ Adapted from the Centers for Disease Control and Prevention (CDC): <http://www.cdc.gov/ncidod/dbmd/diseaseinfo/foodirradiation.htm>.

Which Foodborne Diseases Could Be Prevented with Irradiation?

Treating raw meat and poultry with irradiation at the slaughter plant could eliminate bacteria commonly found on raw meat and raw poultry, such as *E. coli* O157:H7, *Salmonella*, and *Campylobacter*. These organisms currently cause millions of infections and thousands of hospitalizations in the United States every year. Irradiating prepared ready-to-eat meats like hot dogs and deli meats, could eliminate the risk of *Listeria* from such foods. Irradiation could also eliminate parasites like *Cyclospora* and bacteria like *Shigella* and *Salmonella* from fresh produce. The potential benefit is also great for those dry foods that might be stored for long times and transported over great distances, such as spices and grains. Animal feeds are often contaminated with bacteria like *Salmonella*. Irradiation of animal feeds could prevent the spread of *Salmonella* and other pathogens to livestock through feeds.

Irradiation Process

Three different irradiation technologies exist, that use three different kinds of rays: gamma rays, electron beams and x-rays.

The first technology uses the radiation given off by a radioactive substance. This can be either a radioactive form of the element cobalt (Cobalt 60) or of the element cesium (Cesium 137). These substances give off high energy photons, called gamma rays, which can penetrate foods to a depth of several feet. These particular substances do not give off neutrons, which means they do not make anything around them radioactive. This technology has been used routinely for more than thirty years to sterilize medical, dental and household products, and it is also used for radiation treatment of cancer. Radioactive substances emit gamma rays all the time. When not in use, the radioactive "source" is stored down in a pool of water which absorbs the radiation harmlessly and completely. To irradiate food or some other product, the source is pulled up out of the water into a chamber with massive concrete walls that keep any rays from escaping. Medical products or foods to be irradiated are brought into the chamber, and are exposed to the rays for a defined period of time. After it is used, the source is returned to the water tank.

Electron beams, or e-beams, are produced in a different way. The e-beam is a stream of high energy electrons, propelled out of an electron gun. This electron gun apparatus is a larger version of the device in the back of a TV

tube that propels electrons into the TV screen at the front of the tube, making it light up. This electron beam generator can be simply switched on or off. No radioactivity is involved. Some shielding is necessary to protect workers from the electron beam, but not the massive concrete walls required to stop gamma rays. The electrons can penetrate food only to a depth of three centimeters, or a little over an inch, so the food to be treated must be no thicker than that to be treated all the way through. Two opposing beams can treat food that is twice as thick. E-beam medical sterilizers have been in use for at least fifteen years.

The newest technology is X-ray irradiation. This is an outgrowth of e-beam technology, and is still being developed. The X-ray machine is a more powerful version of the machines used in many hospitals and dental offices to take X-ray pictures. To produce the X-rays, a beam of electrons is directed at a thin plate of gold or other metal, producing a stream of X-rays coming out the other side. Like cobalt gamma rays, X-rays can pass through thick foods, and require heavy shielding for safety. However, like e-beams, the machine can be switched on and off, and no radioactive substances are involved. Four commercial X-ray irradiation units have been built in the world since 1996.

How Does Irradiation Affect Foods?

The foods are not changed in nutritional value and they are not made dangerous as a result of the irradiation. The high energy ray is absorbed as it passes through food, and gives up its energy. The food is slightly warmed. Some treated foods may taste slightly different, just as pasteurized milk tastes slightly different from unpasteurized milk. If the food still has living cells, (such as seeds, or shellfish, or potatoes) they will be damaged or killed just as microbes are. This can be a useful effect. For example, it can be used to prolong the shelf life of potatoes by keeping them from sprouting. The energy can induce a few other changes. At levels approved for use on foods, levels of the vitamin thiamine are slightly reduced. This reduction is not enough to result in vitamin deficiency. There are no other significant changes in the amino acid, fatty acid, or vitamin content of food. In fact, the changes induced by irradiation are so minimal that it is not easy to determine whether or not a food has been irradiated.

Irradiated foods need to be stored, handled and cooked in the same way as unirradiated foods. They could still become contaminated with germs during processing after irradiation, if the rules of basic food safety are not followed. Because the irradiated foods have fewer microbes of all sorts,

including those that cause spoilage, they may have a longer shelf life before spoiling.

The safety of irradiated foods has been studied by feeding them to animals and to people. These extensive studies include animal feeding studies lasting for several generations in several different species, including mice, rats, and dogs. There is no evidence of adverse health effects in these well-controlled trials. In addition, NASA astronauts eat foods that have been irradiated to the point of sterilization (substantially higher levels of treatment than that approved for general use) when they fly in space. The safety of irradiated foods has been endorsed by the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC) and by the Assistant Secretary of Health, as well as by the U.S. Department of Agriculture (USDA) and the Food and Drug Administration (FDA).

How Do You Measure the Amount of Irradiation Used?

The dose of irradiation is usually measured in a unit called the Gray, abbreviated Gy.. This is a measure of the amount of energy transferred to food, microbe or other substance being irradiated. 10 kiloGrays, or 10,000 Grays, is the same as an older measure, the megaRad. A single chest X-ray has a dose of roughly a half of a milliGray (a thousandth of a Gray). To kill *Salmonella*, fresh chicken can be irradiated at up to 4.5 kiloGrays, which is about 7 million times more irradiation than a single chest X-ray. To measure the amount of irradiation something is exposed to, photographic film is exposed to the irradiation at the same time. The film fogs at a rate that is proportional to the irradiation level.

The killing effect of irradiation on microbes is measured in D-values. One D-value is the amount of irradiation needed to kill 90% of that organism. For example, it takes 0.3 kiloGrays to kill 90% of *E. coli* O157, so the D-value of *E. coli* is 0.3 kGy. These numbers can be added exponentially. It takes two D (or 0.6 kGy in the case of *E. coli*) to kill 99% of the organisms present, 3 D (or 0.9 kGy) to kill 99.9% and so on. Thus, once you know the D-value for an organism, and how many organisms might possibly be present in a food, the technician can estimate how much irradiation it will take to kill all of them. For example, if you think that a thousand *E. coli* O157 could be present in a food, then you want to be able to treat with at least 4 D, or 4 x 0.3 kGy, or 1.2 kGy. The D-values are different for each organism, and need to be measured for each organism. They can even vary by temperature, and by the specific food.

The energy of e-beams and of x-rays is measured in the amount of energy developed by the electron gun, and is measured in electron volts (eV). The usual apparatus runs at 5 to 10 million electron volts (MeV).

How Does Irradiation Affect Disease-Causing Microbes?

When microbes present in the food are irradiated, the energy from the rays is transferred to the water and other molecules in the microbe. The energy creates transient reactive chemicals that damage the DNA in the microbe, causing defects in the genetic instructions. Unless it can repair this damage, the microbe will die when it grows and tries to duplicate itself. Disease-causing organisms differ in their sensitivity to irradiation, depending on the size of their DNA, the rate at which they can repair damaged DNA, and other factors. It matters if the food is frozen or fresh, as it takes a higher dose to kill microbes in frozen foods.

The size of the DNA “target” in the organism is a major factor. Parasites and insect pests, which have large amounts of DNA, are rapidly killed by extremely low doses of irradiation, with D-values of 0.1 kiloGray or less. It takes more irradiation to kill bacteria, because they have a somewhat smaller DNA, with D-values in the range of 0.3 to 0.7 kiloGray. Some bacteria can form dense hardy spores, which means they enter a compact and inert hibernation state. It takes more irradiation to kill a bacterial spore, with D-values on the order of 2.8 kiloGray. Viruses are the smallest pathogens with that have nucleic acid, and they are in general resistant to irradiation at doses approved for foods. This means that they may have D-values of 10 kG or higher. The prion particles associated with bovine spongiform encephalopathy (BSE, also known as mad cow disease) do not have nucleic acid at all, and so they are not inactivated by irradiation, except at extremely high doses. This means that irradiation will work very well to eliminate parasites and bacteria from food, but will not work to eliminate viruses or prions from food.

Which Foods Can Be Irradiated?

At low doses, irradiation could be used on a wide variety of foods to eliminate insect pests, as a replacement for fumigation with toxic chemicals that is routine for many foods now. It can also inhibit the growth of molds, inhibit sprouting, and prolong the shelf life.

At higher doses, irradiation could be used on a variety of different foods to eliminate parasites and bacteria that cause foodborne disease. Many foods can be irradiated effectively, including meat, poultry, grains, and many seafoods, fruits and vegetables. It is likely to have greatest application for raw foods of animal origin that are made by mixing materials from many animals together, such as ground meat or sausage.

However, not all foods are suitable for irradiation. For example, oysters and other raw shellfish can be irradiated, but the shelf life and quality decreases markedly because the live oyster inside the shell is also damaged or killed by the irradiation. Shell eggs can sometimes be contaminated on the insides with *Salmonella*. However, irradiation causes the egg whites to become milky and more liquid, which means it looks like an older egg, and may not serve as well in some recipes. Alfalfa seeds used in making alfalfa sprouts can sometimes be contaminated with *Salmonella*.

Using irradiation to eliminate *Salmonella* from the seeds may require a dose of irradiation that also interferes with the viability of the seeds themselves. Combining irradiation with other strategies to reduce contamination with germs may overcome these limitations.

Which Foods Have Been Approved for Irradiation in the United States?

A variety of foods have been approved for irradiation in the United States, for several different purposes. For meats, separate approval is required both from the FDA and the USDA.

Approval Year	Food	Dose	Purpose
1963	Wheat flour	0.2-0.5 kGy	Control of mold
1964	White potatoes	0.05-0.15 kGy	Inhibit sprouting
1986	Pork	0.3-1.0 kGy	Kill Trichina parasites
1986	Fruit and vegetables	1.0 kGy	Insect control, increase shelf life
1986	Herbs and spices	30 kGy	Sterilization
1990 - FDA	Poultry	3 kGy	Bacterial pathogen reduction
1992 - USDA	Poultry	1.5-3.0 kGy	Bacterial pathogen reduction
1997 - FDA	Meat	4.5 kGy	Bacterial pathogen reduction
1999 - USDA (pending)	Meat	4.5 kGy	Bacterial pathogen reduction

Which Foods Are Being Irradiated in the U.S.?

A facility in Florida has been irradiating strawberries and other fruits on a limited basis, to prolong shelf life. On a trial basis, fresh tropical fruits from Hawaii have been irradiated before shipping them to the mainland, instead of fumigating them to eliminate the fruit fly pests that could spread to the mainland. Some spices for commercial use have been irradiated. In addition irradiation is widely used to sterilize a variety of medical and household products, from hip joint implants to bandaids and baby pacifiers.

Other technologies used to sterilize fruits, spices and medical devices use toxic chemicals, such as ethylene oxide. Use of irradiation can reduce the use of these other hazardous substances.

How Can I Tell If the Food Has Been Irradiated?

A distinctive logo has been developed for use on food packaging, in order to identify the product as irradiated. This symbol is called the “radura” and is used internationally to mean that the food in the package has been irradiated. A written description may also be present, such as “Irradiated to destroy harmful microbes”. It is not required to label a food if a minor ingredient of the food, such as a spice, has been irradiated itself.

Are Consumers Ready to Buy Irradiated Foods?

Many consumers are quite willing to buy irradiated foods. This is particularly true if the purpose of the irradiation is clearly indicated. Consumers are interested in a process that eliminates harmful microbes from the food and reduce the risk of foodborne disease. In test marketing of specific irradiated foods, consumers have shown that they are willing to buy them. Typically at least half will buy the irradiated food, if given a choice between irradiated product and the same product non-irradiated. If consumers are first educated about what irradiation is and why it is done, approximately 80% will buy the product in these marketing tests.

Would Irradiation Replace Other Foodborne Disease Prevention Efforts?

Irradiation is not a short cut that means food hygiene efforts can be relaxed. Many steps need to be taken from farm to table to make sure that our food supply is clean and safe. Irradiation is a major step forward, but it does not replace other important efforts, including efforts to improve sanitation on the farm and in the food processing plant. For irradiation to be effective, the food that is to be irradiated already needs to be clean. The more initial contamination there is, the higher dose of irradiation it would take to eliminate possible pathogens, and the greater the change in the taste and quality of the food. The protection of irradiation will be overcome if the contamination levels are too high.

The same is true for pasteurized milk. To be pasteurized, milk must be produced in regulated dairy farms, and must be of Grade A quality. Milk that is less than Grade A is not pasteurized for direct sale as milk. Thus, irradiation of food is an important additional step for added safety in the whole farm-to-table continuum of food safety measures.

Is Irradiation of Food Just Like Pasteurization of Milk?

Irradiation has the potential to be used like milk pasteurization in the future. We have confidence in the safety of pasteurized milk for several reasons. The milk is graded and tested to make sure that the milk is clean enough to pasteurize in the first place. Careful industry standards and regulations monitor the effectiveness of the pasteurization process. The pasteurization occurs just before the milk goes into the carton, so the chance of re-

contamination after pasteurization is nearly zero. Similar strategies and designs can make food irradiation as effective as milk pasteurization.

Currently, pasteurization is applied to foods (like milk) that already meet a defined cleanliness standard, and is applied at a dose that gives a standard defined effect. As the irradiation of food becomes commercialized for various foods, similar standardization will be required.

Who Makes Sure That the Irradiation Facilities Are Operated Safely?

The effectiveness of the treatment in eliminating pathogens will be regulated as a food safety process, by either the USDA or the FDA, often in concert with State authorities, just as is the case now for milk pasteurization or retort canning.

The safety of operations of irradiation facilities is regulated separately. This requires extensive worker training, supervision, and regulatory oversight. Facilities using radioactive sources are regulated by the Nuclear Regulatory Commission (NRC). To be licensed, the facility must have been designed with multiple fail-safe measures, and must establish extensive and well documented safety procedures, and worker training. The safe transport of the radioactive sources is regulated by the Department of Transportation.

E-beam and X-ray sources are not monitored by the NRC, but rather by the part of the FDA that regulates medical X-ray devices, and by the same State authorities that regulate other medical, dental and industrial uses of these technologies.

Have There Been Any Accidents Involving Irradiation Facilities?

Medical sterilization facilities have been operated in this country for more than 30 years, without a fatal accident. Over 100 such facilities are currently licensed, along with at least that many medical radiation treatment centers, and bone marrow transplant centers (which also use Cobalt 60 to irradiate patients). No events have been documented in this country that led to exposure of the population at large to radioactivity. In other countries, a small number of fatal incidents have been documented in which a worker

by-passed multiple safety steps to enter the chamber while the source was exposed, resulting in a severe or even lethal radiation injury to themselves.

What Radioactive Waste Is Generated?

Is waste storage or transport a problem? Cobalt 60 is manufactured in a commercial nuclear reactor, by exposing non-radioactive cobalt to intense radiation in the reactor core. Cesium 137 is a by-product of the manufacture of weapons-grade radioactive substances. Thus the supply of these two substances, like that of other radioactive materials used in medicine, science and industry, is dependent on the nuclear industry.

The food irradiation facilities themselves do not become radioactive, and do not create radioactive waste. The cobalt sources used in irradiation facilities decay by 50% in five years, and therefore require periodic replacement. The small radioactive cobalt “pencils” are shipped back to the original nuclear reactor, where they can be recharged for further use. The shipment occurs in special hardened steel canisters that have been designed and tested to survive crashes without breaking. Cobalt is a solid metal, and even if somehow something should break, it will not spread through the environment. Cobalt 60 may also be disposed of as a radioactive waste. Given its relatively short half life(5 years) and its stable metallic form, the material is not considered to be a problematic waste.

In contrast to metallic cobalt, cesium is a salt, which means it can dissolve in water. Cesium 137 sources decay by 50% in 31 years, and therefore are not often replaced. When they are replaced, the old cesium sources will be sent to a storage site in the same special transport canisters. If a leak should occur, there is the possibility that the cesium salts could dissolve in water and thus spread into the environment. This happened at a medical sterilizer facility in Decatur, Georgia in 1992, when a steel container holding the cesium cracked, and some cesium leaked into the shielding water tank.

E-beams and X-ray facilities do not involve radioactive substances.

What about the Effect of Irradiation on Food Packaging Materials?

The food to be irradiated will often already be in its final package. This raises the question about whether the irradiation has any effect on the packaging that might be transferred to the foods. The effect of irradiation on plastics

and other packaging was investigated in the 1960s and early 1970s, in order to identify safe packaging materials for use in the space program. A limited number of materials have been approved for use in packaging food that is to be irradiated. This limited number reflects the limited needs of NASA, not the difficulty of identifying safe products. Many modern packaging materials have simply not been tested. Testing and approving a wider array of packaging materials is critical to the successful commercialization of irradiated foods.

Do Other Countries Irradiate Their Food?

Many other countries have begun to irradiate food, including France, the Netherlands, Portugal, Israel, Thailand, Russia, China and South Africa.

What Is the CDC's Position on Food Irradiation?

CDC has stated that food irradiation is a promising new application of an established technology. It holds great potential for preventing many important foodborne diseases that are transmitted through meat, poultry, fresh produce and other foods. An overwhelming body of scientific evidence demonstrates that irradiation does not harm the nutritional value of food, nor does it make the food unsafe to eat. Just as for the pasteurization of milk, it will be most effective when irradiation is coupled to careful sanitation programs. Consumer confidence will depend on making food clean first, and then using irradiation or pasteurization to make it safe. Food irradiation is a logical next step to reducing the burden of foodborne disease in the United States.

How Can I Find Out More about Food Irradiation?

Basic documents on the safety and efficacy of food irradiation include:

- Lee, Philip R. Assistant Secretary for Health. Irradiation to prevent foodborne illness (Editorial). JAMA 272, p 261, 1994
- Radomyski T, Murano EA, Olson DG, Murano PS. Elimination of pathogens of significance in food by low-dose irradiation: A review. J Food Protection 57:pp73-86, 1994

- Thayer DW, Josephson ES, Brynjolfsson A, Giddings GG. Radiation pasteurization of food Ames (IA). Council for Agricultural Science and Technology; 1996 Issue paper No 7.
- Mussman HC. Potentials of cold pasteurization for the safety of foods of animal origin. J Am Vet Med Assoc, 209, pp 2057-2058, 1996.
- Osterholm, M.T. and M. E. Potter, Irradiation pasteurization of solid foods; taking food safety to the next level. Emerging Infectious Disease, 3:575-577; 1997.
- Joint FAO/IAEA/WHO study group on High-Dose Irradiation. High-dose irradiation: wholesomeness of food irradiated with doses above 10kGy. WHO technical report series 890. World Health Organization, Geneva, 1999.

Web Sites with Information on Food Irradiation

- For general information about food irradiation, see the Web site of the Foundation for Food Irradiation Education: <http://www.food-irradiation.com/>
- For a list of countries using irradiation, see <http://www.iaea.org/icgfi>

Vocabulary Builder

Cesium: A member of the alkali metals. It has an atomic symbol Cs, atomic number 50, and atomic weight 132.91. Cesium has many industrial applications, including the construction of atomic clocks based on its atomic vibrational frequency. [NIH]

Cobalt: A trace element that is a component of vitamin B12. It has the atomic symbol Co, atomic number 27, and atomic weight 58.93. It is used in nuclear weapons, alloys, and pigments. Deficiency in animals leads to anemia; its excess in humans can lead to erythrocytosis. [NIH]

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

Electrons: Stable elementary particles having the smallest known negative charge, present in all elements; also called negatrons. Positively charged electrons are called positrons. The numbers, energies and arrangement of

electrons around atomic nuclei determine the chemical identities of elements. Beams of electrons are called cathode rays or beta rays, the latter being a high-energy biproduct of nuclear decay. [NIH]

Encephalopathy: Any degenerative disease of the brain. [EU]

Fumigation: The application of smoke, vapor, or gas for the purpose of disinfecting or destroying pests or microorganisms. [NIH]

Hibernation: The dormant state in which some animal species pass the winter. It is characterized by narcosis and by sharp reduction in body temperature and metabolic activity and by a depression of vital signs. It is a natural physiological process in many warm-blooded animals. [NIH]

Neutrons: Electrically neutral elementary particles found in all atomic nuclei except light hydrogen; the mass is equal to that of the proton and electron combined and they are unstable when isolated from the nucleus, undergoing beta decay. Slow, thermal, epithermal, and fast neutrons refer to the energy levels with which the neutrons are ejected from heavier nuclei during their decay. [NIH]

Particle: A tiny mass of material. [EU]

Proportional: Being in proportion : corresponding in size, degree, or intensity, having the same or a constant ratio; of, relating to, or used in determining proportions. [EU]

Radioactivity: The quality of emitting or the emission of corpuscular or electromagnetic radiations consequent to nuclear disintegration, a natural property of all chemical elements of atomic number above 83, and possible of induction in all other known elements. [EU]

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

Spices: The dried seeds, bark, root, stems, buds, leaves, or fruit of aromatic plants used to season food. [NIH]

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

Sterilization: 1. the complete destruction or elimination of all living microorganisms, accomplished by physical methods (dry or moist heat), chemical agents (ethylene oxide, formaldehyde, alcohol), radiation (ultraviolet, cathode), or mechanical methods (filtration). 2. any procedure by which an individual is made incapable of reproduction, as by castration, vasectomy, or salpingectomy. [EU]

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]

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 drkoop.com (**<http://www.drkoop.com/>**) and Web MD (**http://my.webmd.com/adam/asset/adam_disease_articles/a_to_z/a**). 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 shigellosis 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>

SHIGELLOSIS 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.

Alimentary: Pertaining to food or nutritive material, or to the organs of digestion. [EU]

Amebiasis: Infection with any of various amebae. It is an asymptomatic carrier state in most individuals, but diseases ranging from chronic, mild diarrhea to fulminant dysentery may occur. [NIH]

Ampicillin: Semi-synthetic derivative of penicillin that functions as an orally active broad-spectrum antibiotic. [NIH]

Analogous: Resembling or similar in some respects, as in function or appearance, but not in origin or development;. [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]

Antibody: An immunoglobulin molecule that has a specific amino acid sequence by virtue of which it interacts only with the antigen that induced its synthesis in cells of the lymphoid series (especially plasma cells), or with antigen closely related to it. Antibodies are classified according to their mode of action as agglutinins, bacteriolysins, haemolysins, opsonins, precipitins, etc. [EU]

Antigen: Any substance which is capable, under appropriate conditions, of inducing a specific immune response and of reacting with the products of that response, that is, with specific antibody or specifically sensitized T-lymphocytes, or both. Antigens may be soluble substances, such as toxins and foreign proteins, or particulate, such as bacteria and tissue cells; however, only the portion of the protein or polysaccharide molecule known as the antigenic determinant (q.v.) combines with antibody or a specific receptor on a lymphocyte. Abbreviated Ag. [EU]

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

Aqueous: Watery; prepared with water. [EU]

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

Atropine: A toxic alkaloid, originally from *Atropa belladonna*, but found in other plants, mainly Solanaceae. [NIH]

Atypical: Irregular; not conformable to the type; in microbiology, applied specifically to strains of unusual type. [EU]

Bacillus: A genus of bacteria of the family Bacillaceae, including large aerobic or facultatively anaerobic, spore-forming, rod-shaped cells, the great majority of which are gram-positive and motile. The genus is separated into 48 species, of which three are pathogenic, or potentially pathogenic, and the remainder are saprophytic soil forms. Many organisms historically called *Bacillus* are now classified in other genera. [EU]

Bacteremia: The presence of viable bacteria circulating in the blood. Fever, chills, tachycardia, and tachypnea are common acute manifestations of bacteremia. The majority of cases are seen in already hospitalized patients, most of whom have underlying diseases or procedures which render their bloodstreams susceptible to invasion. [NIH]

Bacteria: Unicellular prokaryotic microorganisms which generally possess rigid cell walls, multiply by cell division, and exhibit three principal forms: round or coccid, rodlike or bacillary, and spiral or spirochetal. [NIH]

Biochemical: Relating to biochemistry; characterized by, produced by, or involving chemical reactions in living organisms. [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, $(CH_2O)_n$. The most important carbohydrates are the starches, sugars, celluloses, and gums. They are classified into mono-, di-, tri-, poly- and heterosaccharides. [EU]

Cesium: A member of the alkali metals. It has an atomic symbol Cs, atomic number 55, and atomic weight 132.91. Cesium has many industrial applications, including the construction of atomic clocks based on its atomic vibrational frequency. [NIH]

Chlamydia: A genus of the family chlamydiaceae whose species cause a variety of diseases in vertebrates including humans, mice, and swine. Chlamydia species are gram-negative and produce glycogen. The type species is *chlamydia trachomatis*. [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]

Ciprofloxacin: A carboxyfluoroquinoline antimicrobial agent that is effective against a wide range of microorganisms. It has been successfully and safely used in the treatment of resistant respiratory, skin, bone, joint, gastrointestinal, urinary, and genital infections. [NIH]

Cobalt: A trace element that is a component of vitamin B12. It has the atomic symbol Co, atomic number 27, and atomic weight 58.93. It is used in nuclear weapons, alloys, and pigments. Deficiency in animals leads to anemia; its excess in humans can lead to erythrocytosis. [NIH]

Colic: Paroxysms of pain. This condition usually occurs in the abdominal region but may occur in other body regions as well. [NIH]

Colitis: Inflammation of the colon. [EU]

Concomitant: Accompanying; accessory; joined with another. [EU]

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

Convalescence: The stage of recovery following an attack of disease, a surgical operation, or an injury. [EU]

Convulsion: A violent involuntary contraction or series of contractions of the voluntary muscles. [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]

Cytokines: Non-antibody proteins secreted by inflammatory leukocytes and some non-leukocytic cells, that act as intercellular mediators. They differ from classical hormones in that they are produced by a number of tissue or cell types rather than by specialized glands. They generally act locally in a paracrine or autocrine rather than endocrine manner. [NIH]

Cytoplasm: The protoplasm of a cell exclusive of that of the nucleus; it consists of a continuous aqueous solution (cytosol) and the organelles and inclusions suspended in it (phaneroplasm), and is the site of most of the chemical activities of the cell. [EU]

Cytotoxic: Pertaining to or exhibiting cytotoxicity. [EU]

Cytotoxins: Substances elaborated by microorganisms, plants or animals that are specifically toxic to individual cells; they may be involved in immunity or may be contained in venoms. [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]

Diphenoxylate: A meperidine congener used as an antidiarrheal, usually in combination with atropine. At high doses, it acts like morphine. Its unesterified metabolite difenoxin has similar properties and is used similarly. It has little or no analgesic activity. [NIH]

Diphtheria: A localized infection of mucous membranes or skin caused by toxigenic strains of *Corynebacterium diphtheriae*. It is characterized by the presence of a pseudomembrane at the site of infection. Diphtheria Toxin, produced by *C. diphtheriae*, can cause myocarditis, polyneuritis, and other systemic toxic effects. [NIH]

Disinfectant: An agent that disinfects; applied particularly to agents used on inanimate objects. [EU]

Dominance: In genetics, the full phenotypic expression of a gene in both heterozygotes and homozygotes. [EU]

Dysentery: Any of various disorders marked by inflammation of the intestines, especially of the colon, and attended by pain in the abdomen, tenesmus, and frequent stools containing blood and mucus. Causes include chemical irritants, bacteria, protozoa, or parasitic worms. [EU]

Electrons: Stable elementary particles having the smallest known negative charge, present in all elements; also called negatrons. Positively charged electrons are called positrons. The numbers, energies and arrangement of electrons around atomic nuclei determine the chemical identities of elements. Beams of electrons are called cathode rays or beta rays, the latter being a high-energy biproduct of nuclear decay. [NIH]

Electrophoresis: An electrochemical process in which macromolecules or colloidal particles with a net electric charge migrate in a solution under the influence of an electric current. [NIH]

Empiric: Empirical; depending upon experience or observation alone, without using scientific method or theory. [EU]

Encephalopathy: Any degenerative disease of the brain. [EU]

Endemic: Present or usually prevalent in a population or geographical area at all times; said of a disease or agent. Called also endemial. [EU]

Enterotoxins: Substances that are toxic to the intestinal tract causing vomiting, diarrhea, etc.; most common enterotoxins are produced by bacteria. [NIH]

Enzyme: A protein molecule that catalyses chemical reactions of other substances without itself being destroyed or altered upon completion of the reactions. Enzymes are classified according to the recommendations of the Nomenclature Committee of the International Union of Biochemistry. Each enzyme is assigned a recommended name and an Enzyme Commission (EC)

number. They are divided into six main groups; oxidoreductases, transferases, hydrolases, lyases, isomerases, and ligases. [EU]

Epidemic: Occurring suddenly in numbers clearly in excess of normal expectancy; said especially of infectious diseases but applied also to any disease, injury, or other health-related event occurring in such outbreaks. [EU]

Epidemiological: Relating to, or involving epidemiology. [EU]

Epithelium: The covering of internal and external surfaces of the body, including the lining of vessels and other small cavities. It consists of cells joined by small amounts of cementing substances. Epithelium is classified into types on the basis of the number of layers deep and the shape of the superficial cells. [EU]

Epitopes: Sites on an antigen that interact with specific antibodies. [NIH]

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]

Exogenous: Developed or originating outside the organism, as exogenous disease. [EU]

Extracellular: Outside a cell or cells. [EU]

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]

Flagellin: A protein with a molecular weight of 40,000 isolated from bacterial flagella. At appropriate pH and salt concentration, three flagellin monomers can spontaneously reaggregate to form structures which appear identical to intact flagella. [NIH]

Fluorescence: The property of emitting radiation while being irradiated. The radiation emitted is usually of longer wavelength than that incident or absorbed, e.g., a substance can be irradiated with invisible radiation and emit visible light. X-ray fluorescence is used in diagnosis. [NIH]

Fumigation: The application of smoke, vapor, or gas for the purpose of disinfecting or destroying pests or microorganisms. [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]

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

Gelsolin: A 90-kD protein produced by macrophages that severs actin filaments and forms a cap on the newly exposed filament end. Gelsolin is activated by calcium ions and participates in the assembly and disassembly of actin, thereby increasing the motility of some cells. [NIH]

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]

Gonorrhea: Acute infectious disease characterized by primary invasion of the urogenital tract. The etiologic agent, neisseria gonorrhoeae, was isolated by Neisser in 1879. [NIH]

Helicobacter: A genus of gram-negative, spiral-shaped bacteria that is pathogenic and has been isolated from the intestinal tract of mammals, including humans. [NIH]

Hepatitis: Inflammation of the liver. [EU]

Herpes: Any inflammatory skin disease caused by a herpesvirus and characterized by the formation of clusters of small vesicles. When used alone, the term may refer to herpes simplex or to herpes zoster. [EU]

Hibernation: The dormant state in which some animal species pass the winter. It is characterized by narcosis and by sharp reduction in body temperature and metabolic activity and by a depression of vital signs. It is a natural physiological process in many warm-blooded animals. [NIH]

Homologous: Corresponding in structure, position, origin, etc., as (a) the feathers of a bird and the scales of a fish, (b) antigen and its specific antibody, (c) allelic chromosomes. [EU]

Humoral: Of, relating to, proceeding from, or involving a bodily humour - now often used of endocrine factors as opposed to neural or somatic. [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]

Immunotoxins: Semisynthetic conjugates of various toxic molecules, including radioactive isotopes and bacterial or plant toxins, with specific immune substances such as immunoglobulins, monoclonal antibodies, and antigens. The antitumor or antiviral immune substance carries the toxin to the tumor or infected cell where the toxin exerts its poisonous effect. [NIH]

Induction: The act or process of inducing or causing to occur, especially the production of a specific morphogenetic effect in the developing embryo through the influence of evocators or organizers, or the production of

anaesthesia or unconsciousness by use of appropriate agents. [EU]

Inflammation: A pathological process characterized by injury or destruction of tissues caused by a variety of cytologic and chemical reactions. It is usually manifested by typical signs of pain, heat, redness, swelling, and loss of function. [NIH]

Insulin: A protein hormone secreted by beta cells of the pancreas. Insulin plays a major role in the regulation of glucose metabolism, generally promoting the cellular utilization of glucose. It is also an important regulator of protein and lipid metabolism. Insulin is used as a drug to control insulin-dependent diabetes mellitus. [NIH]

Intoxication: Poisoning, the state of being poisoned. [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]

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]

Localization: 1. the determination of the site or place of any process or lesion. 2. restriction to a circumscribed or limited area. 3. prelocalization. [EU]

Malaise: A vague feeling of bodily discomfort. [EU]

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

Meningitis: Inflammation of the meninges. When it affects the dura mater, the disease is termed pachymeningitis; when the arachnoid and pia mater are involved, it is called leptomeningitis, or meningitis proper. [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]

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

Motility: The ability to move spontaneously. [EU]

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

Neutrons: Electrically neutral elementary particles found in all atomic nuclei except light hydrogen; the mass is equal to that of the proton and

electron combined and they are unstable when isolated from the nucleus, undergoing beta decay. Slow, thermal, epithermal, and fast neutrons refer to the energy levels with which the neutrons are ejected from heavier nuclei during their decay. [NIH]

Neutrophil: Having an affinity for neutral dyes. [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]

Nitrogen: An element with the atomic symbol N, atomic number 7, and atomic weight 14. Nitrogen exists as a diatomic gas and makes up about 78% of the earth's atmosphere by volume. It is a constituent of proteins and nucleic acids and found in all living cells. [NIH]

Ophthalmic: Pertaining to the eye. [EU]

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

Particle: A tiny mass of material. [EU]

Pathogen: Any disease-producing microorganism. [EU]

Pediatrics: A medical specialty concerned with maintaining health and providing medical care to children from birth to adolescence. [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]

Prophylaxis: The prevention of disease; preventive treatment. [EU]

Proportional: Being in proportion : corresponding in size, degree, or intensity, having the same or a constant ratio; of, relating to, or used in determining proportions. [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]

Pseudomonas: A genus of gram-negative, aerobic, rod-shaped bacteria widely distributed in nature. Some species are pathogenic for humans, animals, and plants. [NIH]

Quercetin: Aglucon of quercetrin, rutin, and other glycosides. It is widely distributed in the plant kingdom, especially in rinds and barks, clover blossoms, and ragweed pollen. [NIH]

Radioactivity: The quality of emitting or the emission of corpuscular or

electromagnetic radiations consequent to nuclear disintegration, a natural property of all chemical elements of atomic number above 83, and possible of induction in all other known elements. [EU]

Reactivation: The restoration of activity to something that has been inactivated. [EU]

Reagent: A substance employed to produce a chemical reaction so as to detect, measure, produce, etc., other substances. [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]

Recombinant: 1. a cell or an individual with a new combination of genes not found together in either parent; usually applied to linked genes. [EU]

Reconstitution: 1. a type of regeneration in which a new organ forms by the rearrangement of tissues rather than from new formation at an injured surface. 2. the restoration to original form of a substance previously altered for preservation and storage, as the restoration to a liquid state of blood serum or plasma that has been dried and stored. [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]

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]

Secretion: 1. the process of elaborating a specific product as a result of the activity of a gland; this activity may range from separating a specific substance of the blood to the elaboration of a new chemical substance. 2. any substance produced by secretion. [EU]

Seizures: Clinical or subclinical disturbances of cortical function due to a sudden, abnormal, excessive, and disorganized discharge of brain cells. Clinical manifestations include abnormal motor, sensory and psychic

phenomena. Recurrent seizures are usually referred to as epilepsy or "seizure disorder." [NIH]

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]

Serum: The clear portion of any body fluid; the clear fluid moistening serous membranes. 2. blood serum; the clear liquid that separates from blood on clotting. 3. immune serum; blood serum from an immunized animal used for passive immunization; an antiserum; antitoxin, or antivenin. [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]

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

Sterilization: 1. the complete destruction or elimination of all living microorganisms, accomplished by physical methods (dry or moist heat), chemical agents (ethylene oxide, formaldehyde, alcohol), radiation (ultraviolet, cathode), or mechanical methods (filtration). 2. any procedure by which an individual is made incapable of reproduction, as by castration, vasectomy, or salpingectomy. [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 allaying 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]

Topical: Pertaining to a particular surface area, as a topical anti-infective

applied to a certain area of the skin and affecting only the area to which it is applied. [EU]

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

Urethritis: Inflammation of the urethra. [EU]

Urinary: Pertaining to the urine; containing or secreting urine. [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 vibronaceae, 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]

Vinculin: A cytoskeletal protein associated with cell-cell and cell-matrix interactions. The amino acid sequence of human vinculin has been determined. The protein consists of 1066 amino acid residues and its gene has been assigned to chromosome 10. [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]

Warts: Benign epidermal proliferations or tumors; some are viral in origin. [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 Acronyms & 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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