THE OFFICIAL
PATIENT'S SOURCEBOOK
On

HOOKWORM INFECTION

A Revised and Updated Directory for the Internet Age

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

A REFERENCE MANUAL FOR SELF-DIRECTED PATIENT RESEARCH

Full Internet Referencing – Essentials and Advanced Studies – Chapter Glossaries

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Dedication

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

Acknowledgements

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

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- The Official Patient's Sourcebook on Amebiasis
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- The Official Patient's Sourcebook on Anisakiasis
- The Official Patient's Sourcebook on Ascaris Infection
- The Official Patient's Sourcebook on Babesia Infection
- The Official Patient's Sourcebook on Balantidiasis
- The Official Patient's Sourcebook on Baylisascaris
- The Official Patient's Sourcebook on Blastocystis Hominis
- The Official Patient's Sourcebook on Body Lice
- The Official Patient's Sourcebook on Capillaria Infection
- The Official Patient's Sourcebook on Chagas Disease
- The Official Patient's Sourcebook on Chronic Diarrhea
- The Official Patient's Sourcebook on Clonorchiasis
- The Official Patient's Sourcebook on Cryptosporidium
- The Official Patient's Sourcebook on Cysticercosis
- The Official Patient's Sourcebook on Dientamoeba Fragilis
- The Official Patient's Sourcebook on Diphyllobothrium Infection
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- The Official Patient's Sourcebook on East African Trypanosomiasis
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- The Official Patient's Sourcebook on Fasciolopsiasis
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- The Official Patient's Sourcebook on Infection with Nonpathogenic Intestinal Amebas
- The Official Patient's Sourcebook on Isospora Belli
- The Official Patient's Sourcebook on Leishmaniasis
- The Official Patient's Sourcebook on Lymphatic Filariasis
- The Official Patient's Sourcebook on Microsporidiosis

- The Official Patient's Sourcebook on Naegleria
- The Official Patient's Sourcebook on Opisthorchis
- The Official Patient's Sourcebook on Paragonimus
- The Official Patient's Sourcebook on Pinworm Infection
- The Official Patient's Sourcebook on Pneumocystis Carinii
- The Official Patient's Sourcebook on Pubic Lice
- The Official Patient's Sourcebook on Scabies
- The Official Patient's Sourcebook on Schistosomiasis
- The Official Patient's Sourcebook on Strongyloides
- The Official Patient's Sourcebook on Swimmer's Itch
- The Official Patient's Sourcebook on Taenia Saginata
- The Official Patient's Sourcebook on Toxocariasis
- The Official Patient's Sourcebook on Toxoplasmosis
- The Official Patient's Sourcebook on Trichinosis
- The Official Patient's Sourcebook on Trichomonas Infection
- The Official Patient's Sourcebook on Trichuris Trichiura
- The Official Patient's Sourcebook on West African Trypanosomiasis

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INTRODUCTION

Overview

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

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

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

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

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

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

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

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

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

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

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

Organization

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

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

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

Scope

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

- Ancylostoma Duodenale
- Necator Americanus

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

- 126.35 hookworm

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 hookworm infection. You may find it useful to refer to synonyms when accessing databases or interacting with healthcare professionals and medical librarians.

Moving Forward

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

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

Why "Internet age"? All too often, patients diagnosed with hookworm infection will log on to the Internet, type words into a search engine, and receive several Web site listings which are mostly irrelevant or redundant. 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 hookworm infection is even indexed in search engines, a non-systematic

[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."

approach often leads to frustration and disappointment. With this sourcebook, we hope to direct you to the information you need that you would not likely find using popular Web directories. Beyond Web listings, in many cases we will reproduce brief summaries or abstracts of available reference materials. These abstracts often contain distilled information on topics of discussion.

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

The Editors

PART I: THE ESSENTIALS

ABOUT PART I

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

CHAPTER 1. THE ESSENTIALS ON HOOKWORM INFECTION: GUIDELINES

Overview

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

The National Institutes of Health (NIH)[5]

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

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

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

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

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

What Is Hookworm?[7]

Hookworm is an intestinal parasite of humans that usually causes mild diarrhea or cramps. Heavy infection with hookworm can create serious health problems for newborns, children, pregnant women, and persons who

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

[7] Adapted from The Centers for Disease Control and Prevention (CDC): **http://www.cdc.gov/ncidod/dpd/parasites/hookworm/factsht_hookworm.htm**.

are malnourished. Hookworm infections occur mostly in tropical and subtropical climates and are estimated to infect about 1 billion people -- about one-fifth of the world's population.

Where Are Hookworms Commonly Found?

One of the most common species, Ancylostoma duodenale (an-cy-CLO-sto-ma doe-AH-den-al), is found in southern Europe, northern Africa, northern Asia, and parts of South America. A second species, Necator americanus (ne-KAY-tor am-er-i-CON-us), was widespread in the southeastern United States early in this century. The Rockefeller Sanitary Commission was founded in response, and hookworm infection has been largely controlled.

How Do I Get a Hookworm Infection?

You can become infected by direct contact with contaminated soil, generally through walking barefoot, or accidentally swallowing contaminated soil.

Hookworms have a complex life cycle that begins and ends in the small intestine. Hookworm eggs require warm, moist, shaded soil to hatch into larvae. These barely visible larvae penetrate the skin (often through bare feet), are carried to the lungs, go through the respiratory tract to the mouth, are swallowed, and eventually reach the small intestine. This journey takes about a week. In the small intestine, the larvae develop into half-inch-long worms, attach themselves to the intestinal wall, and suck blood. The adult worms produce thousands of eggs. These eggs are passed in the feces (stool). If the eggs contaminate soil and conditions are right, they will hatch, molt, and develop into infective larvae again after 5 to 10 days.

Who Is at Risk?

People who have direct contact with soil that contains human feces in areas where hookworm is common are at high risk of infection. Children --because they play in dirt and often go barefoot-- are at high risk. Since transmission of hookworm infection requires development of the larvae in soil, hookworm cannot be spread person to person. Contact among children in institutional or child care settings should not increase the risk of infection.

What Are the Symptoms of Hookworm?

Itching and a rash at the site of where skin touched soil or sand is usually the first sign of infection. These symptoms occur when the larvae penetrate the skin. While a light infection may cause no symptoms, heavy infection can cause anemia, abdominal pain, diarrhea, loss of appetite, and weight loss. Heavy, chronic infections can cause stunted growth and mental development.

Can a Hookworm Infection Cause Any Serious Health Problems?

Yes. The most serious results of hookworm infection are the development of anemia and protein deficiency caused by blood loss. When children are continuously infected by many worms, the loss of iron and protein can retard growth and mental development, sometimes irreversibly. Hookworm infection can also cause tiredness, difficulty breathing, enlargement of the heart, and irregular heartbeat. Sometimes hookworm infection is fatal, especially among infants.

What Should I Do If I Think I Have a Hookworm Infection?

Visit your health care provider. Infection is diagnosed by identifying hookworm eggs in a stool sample.

What Is the Treatment for Hookworm?

In countries where hookworm is common and reinfection is likely, light infections are often not treated. In the United States, hookworm infections are generally treated for 1-3 days with medication prescribed by your health care provider. The drugs are effective and appear to have few side effects. For children under the age of 2, the decision to treat should be made by their health care provider.

Another stool exam should be repeated 1 to 2 weeks after therapy. If the infection is still present, treatment will be given again. Iron supplements will be ordered if you have anemia.

How Can I Prevent Hookworm?

Do not walk barefoot or contact the soil with bare hands in areas where hookworm is common or there is likely to be feces in the soil or sand.

Hookworm Infection: Technical Notes

DPDx is a Web site developed and maintained by CDC's Division of Parasitic Diseases (DPD). Their goal is to use the Internet to strengthen diagnosis of parasitic diseases, both in the United States and abroad. For that purpose, DPDx offers two complementary functions: (1) a reference and training function, in which all users can browse through concise reviews of parasites and parasitic diseases, including an image library and a review of recommended procedures for collecting, shipping, processing, and examining biologic specimens, and (2) a diagnostic assistance function, in which laboratorians and other health professionals desiring assistance in parasite identification can ask questions and/or send digital images of specimens for expedited review and consultation with DPD staff. The review below is adapted from a DPDx review of hookworm infection.[8] As the information was prepared for healthcare professionals, some of the language is technical. Relevant terms are defined in the vocabulary builder at the end of this chapter.

Causal Agents

The human hookworms include two nematode (roundworm) species, Ancylostoma duodenale and Necator americanus. (Adult females: 10 to 13 mm (A. duodenale), 9 to 11 mm (N. americanus); adult males: 8 to 11 mm (A. duodenale), 7 to 9 mm (N. americanus). A smaller group of hookworms infecting animals can invade and parasitize humans (A. ceylanicum) or can penetrate the human skin (causing cutaneous larva migrans), but do not develop any further (A. braziliense, Uncinaria stenocephala).

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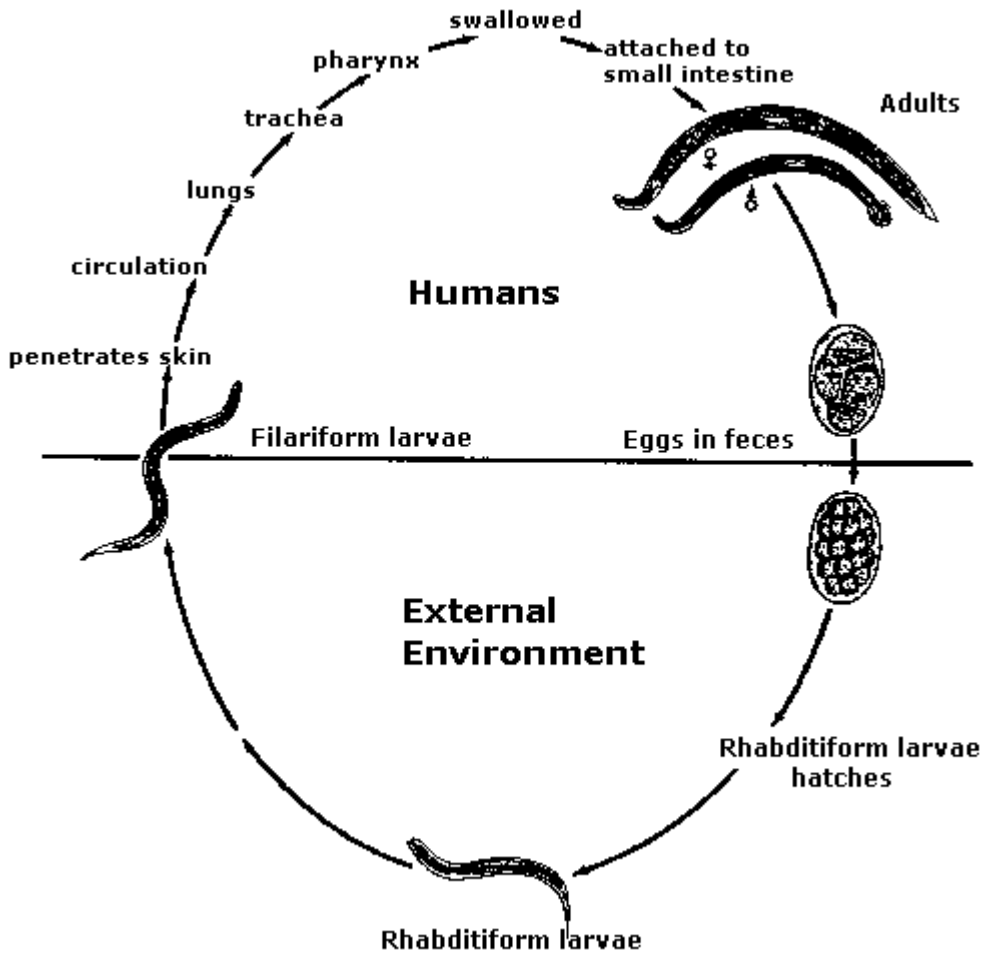
[8] This paragraph has been adapted from the DPDx: **http://www.dpd.cdc.gov/dpdx/HTML/Hookworm.htm**. The review of hookworm infection has been adapted from the DPDx Web site. Further treatment information in The Medical Letter (**http://www.medletter.com/**) is recommended in the DPDx. The section of "Diagnostic Findings" which provides diagnostic images and related information should be viewed separately at: **http://www.dpd.cdc.gov/dpdx/HTML/Frames/G-L/Hookworm/body_Hookworm_mic1.htm**.

Life Cycle



Adult worms live in the lumen of the small intestine, where they attach to the intestinal wall with resultant host blood loss. Eggs are passed in the stool, and under favorable conditions (moisture, warmth, shade), hatch in 1 to 2 days. Larvae are released, grow in the feces and/or the soil, and after 5 to 10 days (and two molts) have become filariform (L-3) larvae that are infective. These infective larvae can survive 3 to 4 weeks in favorable environments. On contact with the human host, the larvae penetrate the skin and are carried through the veins and the heart to the lungs. They penetrate into the pulmonary alveolae, ascend the bronchial tree to the pharynx, and are swallowed. Upon reaching the small intestine, they undergo two more molts yielding fourth stage larvae (L4) and then adult worms. Five weeks or more are required from invasion by the L3 to oviposition by the adult female. Most adult worms are eliminated in 1 to 2 years, but longevity records can reach several years. Some A. duodenale larvae, following

penetration of the host skin, can become dormant (in the intestine or muscle!). In addition, infection by A. duodenale may probably also occur by the oral and transmammary route. (N. americanus, however, requires a transpulmonary migration phase.)

Geographic Distribution

The second most common human helminthic infection (after ascariasis). Worldwide distribution, mostly in areas with moist, warm climate. Both N. americanus and A. duodenale are found in Africa, Asia and the Americas. Necator americanus predominates in the Americas and Australia, while only A. duodenale is found in the Middle East, North Africa and southern Europe.

Clinical Features

Iron deficiency anemia (caused by blood loss at the site of intestinal attachment of the adult worms) is the most common symptom of hookworm infection, and can be accompanied by cardiac complications. Gastrointestinal and nutritional/metabolic symptoms can also occur. In addition, local skin manifestations ("ground itch") can occur during penetration by the filariform (L3) larvae, and respiratory symptoms can be observed during pulmonary migration of the larvae.

Laboratory Diagnosis

Microscopic identification of eggs in the stool is the most common method for diagnosing hookworm infection. The recommended procedure is as follows:

- Collect a stool specimen.
- Fix the specimen in 10% formalin.
- Concentrate using the formalin – ethyl acetate sedimentation technique.
- Examine a wet mount of the sediment.

Where concentration procedures are not available, a direct wet mount examination of the specimen is adequate for detecting moderate to heavy

infections. For quantitative assessments of infection, various methods such as the Kato-Katz can be used.

Treatment

In countries where hookworm is common and reinfection is likely, light infections are often not treated. In the United States, hookworm infections are generally treated for 1-3 days with albendazole[9].

More Guideline Sources

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

Topic Pages: MEDLINEplus

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

If you do not find topics of interest when browsing health topic pages, then you can choose to use the advanced search utility of MEDLINEplus at **http://www.nlm.nih.gov/medlineplus/advancedsearch.html**. This utility is

[9] This drug has been approved by the FDA, but it is considered investigational for this purpose.

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 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 hookworm infection. The drawbacks of this approach are that the information is not organized by theme and that the references are often a mix of information for professionals and patients. Nevertheless, a large number of the listed Web sites provide useful background information. We can only recommend this route, therefore, for relatively rare or specific disorders, or when using highly targeted searches. To use the NIH search utility, visit the following Web page: **http://search.nih.gov/index.html**.

Additional Web Sources

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

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

Vocabulary Builder

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

Abdominal: Pertaining to the abdomen. [EU]

Ancylostoma: A genus of nematode intestinal parasites that consists of several species. A. duodenale is the common hookworm in humans. A. braziliense, A. ceylonicum, and A. caninum occur primarily in cats and dogs, but all have been known to occur in humans. [NIH]

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

Ascariasis: Infection by nematodes of the genus ascaris. Ingestion of infective eggs causes diarrhea and pneumonitis. Its distribution is more prevalent in areas of poor sanitation and where human feces are used for fertilizer. [NIH]

Bronchial: Pertaining to one or more bronchi. [EU]

Cardiac: Pertaining to the heart. [EU]

Causal: Pertaining to a cause; directed against a cause. [EU]

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

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

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

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

Intestinal: Pertaining to the intestine. [EU]

Lumen: The cavity or channel within a tube or tubular organ. [EU]

Mental: Pertaining to the mind; psychic. 2. (L. mentum chin) pertaining to the chin. [EU]

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

Necator: A genus of intestinal parasite worms which includes one of the most important hookworms of man, necator americanus. The only other known species, N. suillus, has been recovered from pigs. [NIH]

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

Parasitic: Pertaining to, of the nature of, or caused by a parasite. [EU]

Pulmonary: Pertaining to the lungs. [EU]

Reinfection: A second infection by the same pathogenic agent, or a second infection of an organ such as the kidney by a different pathogenic agent. [EU]

Sedimentation: The act of causing the deposit of sediment, especially by the use of a centrifugal machine. [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]

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

Veins: The vessels carrying blood toward the heart. [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 hookworm infection. These associations can become invaluable sources of information and advice. Many associations offer aftercare support, financial assistance, and other important services. Furthermore, healthcare research has shown that support groups often help people to better cope with their conditions.[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 hookworm infection. The chapter ends with a discussion on how to find a doctor that is right for you.

Associations and Hookworm Infection

As mentioned by the Agency for Healthcare Research and Quality, sometimes the emotional side of an illness can be as taxing as the physical side.[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 hookworm infection. For more information, see the NHIC's Web site at **http://www.health.gov/NHIC/** or contact an information specialist by calling 1-800-336-4797.

DIRLINE

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

The Combined Health Information Database

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

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

The National Organization for Rare Disorders, Inc.

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

Online Support Groups

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

Finding Doctors

One of the most important aspects of your treatment will be the relationship between you and your doctor or specialist. All patients with hookworm infection must go through the process of selecting a physician. While this process will vary from person to person, the Agency for Healthcare Research and Quality makes a number of suggestions, including the following:[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 Doctor[14]

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

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

Working with Your Doctor[15]

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

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

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[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.

CHAPTER 3. CLINICAL TRIALS AND HOOKWORM INFECTION

Overview

Very few medical conditions have a single treatment. The basic treatment guidelines that your physician has discussed with you, or those that you have found using the techniques discussed in Chapter 1, may provide you with all that you will require. For some patients, current treatments can be enhanced with new or innovative techniques currently under investigation. In this chapter, we will describe how clinical trials work and show you how to keep informed of trials concerning hookworm infection.

What Is a Clinical Trial?[17]

Clinical trials involve the participation of people in medical research. Most medical research begins with studies in test tubes and on animals. Treatments that show promise in these early studies may then be tried with people. The only sure way to find out whether a new treatment is safe, effective, and better than other treatments for hookworm infection is to try it on patients in a clinical trial.

[17] The discussion in this chapter has been adapted from the NIH and the NEI: **www.nei.nih.gov/netrials/ctivr.htm**.

What Kinds of Clinical Trials Are There?

Clinical trials are carried out in three phases:

- **Phase I.** Researchers first conduct Phase I trials with small numbers of patients and healthy volunteers. If the new treatment is a medication, researchers also try to determine how much of it can be given safely.
- **Phase II.** Researchers conduct Phase II trials in small numbers of patients to find out the effect of a new treatment on hookworm infection.
- **Phase III.** Finally, researchers conduct Phase III trials to find out how new treatments for hookworm infection compare with standard treatments already being used. Phase III trials also help to determine if new treatments have any side effects. These trials--which may involve hundreds, perhaps thousands, of people--can also compare new treatments with no treatment.

How Is a Clinical Trial Conducted?

Various organizations support clinical trials at medical centers, hospitals, universities, and doctors' offices across the United States. The "principal investigator" is the researcher in charge of the study at each facility participating in the clinical trial. Most clinical trial researchers are medical doctors, academic researchers, and specialists. The "clinic coordinator" knows all about how the study works and makes all the arrangements for your visits.

All doctors and researchers who take part in the study on hookworm infection carefully follow a detailed treatment plan called a protocol. This plan fully explains how the doctors will treat you in the study. The "protocol" ensures that all patients are treated in the same way, no matter where they receive care.

Clinical trials are controlled. This means that researchers compare the effects of the new treatment with those of the standard treatment. In some cases, when no standard treatment exists, the new treatment is compared with no treatment. Patients who receive the new treatment are in the treatment group. Patients who receive a standard treatment or no treatment are in the "control" group. In some clinical trials, patients in the treatment group get a new medication while those in the control group get a placebo. A placebo is a harmless substance, a "dummy" pill, that has no effect on hookworm infection. In other clinical trials, where a new surgery or device (not a medicine) is being tested, patients in the control group may receive a "sham

treatment." This treatment, like a placebo, has no effect on hookworm infection and does not harm patients.

Researchers assign patients "randomly" to the treatment or control group. This is like flipping a coin to decide which patients are in each group. If you choose to participate in a clinical trial, you will not know which group you will be appointed to. The chance of any patient getting the new treatment is about 50 percent. You cannot request to receive the new treatment instead of the placebo or sham treatment. Often, you will not know until the study is over whether you have been in the treatment group or the control group. This is called a "masked" study. In some trials, neither doctors nor patients know who is getting which treatment. This is called a "double masked" study. These types of trials help to ensure that the perceptions of the patients or doctors will not affect the study results.

Natural History Studies

Unlike clinical trials in which patient volunteers may receive new treatments, natural history studies provide important information to researchers on how hookworm infection develops over time. A natural history study follows patient volunteers to see how factors such as age, sex, race, or family history might make some people more or less at risk for hookworm infection. A natural history study may also tell researchers if diet, lifestyle, or occupation affects how a disease or disorder develops and progresses. Results from these studies provide information that helps answer questions such as: How fast will a disease or disorder usually progress? How bad will the condition become? Will treatment be needed?

What Is Expected of Patients in a Clinical Trial?

Not everyone can take part in a clinical trial for a specific disease or disorder. Each study enrolls patients with certain features or eligibility criteria. These criteria may include the type and stage of disease or disorder, as well as, the age and previous treatment history of the patient. You or your doctor can contact the sponsoring organization to find out more about specific clinical trials and their eligibility criteria. If you are interested in joining a clinical trial, your doctor must contact one of the trial's investigators and provide details about your diagnosis and medical history.

If you participate in a clinical trial, you may be required to have a number of medical tests. You may also need to take medications and/or undergo

surgery. Depending upon the treatment and the examination procedure, you may be required to receive inpatient hospital care. Or, you may have to return to the medical facility for follow-up examinations. These exams help find out how well the treatment is working. Follow-up studies can take months or years. However, the success of the clinical trial often depends on learning what happens to patients over a long period of time. Only patients who continue to return for follow-up examinations can provide this important long-term information.

Recent Trials on Hookworm Infection

The National Institutes of Health and other organizations sponsor trials on various diseases and disorders. Because funding for research goes to the medical areas that show promising research opportunities, it is not possible for the NIH or others to sponsor clinical trials for every disease and disorder at all times. The following lists recent trials dedicated to hookworm infection.[18] If the trial listed by the NIH is still recruiting, you may be eligible. If it is no longer recruiting or has been completed, then you can contact the sponsors to learn more about the study and, if published, the results. Further information on the trial is available at the Web site indicated. Please note that some trials may no longer be recruiting patients or are otherwise closed. Before contacting sponsors of a clinical trial, consult with your physician who can help you determine if you might benefit from participation.

- **Parasitic Infections of the Gastrointestinal Tract**

  Condition(s): Amebiasis; Cryptosporidiosis; Giardiasis; Parasitic Disease; Parasitic Intestinal Disease

  Study Status: This study is currently recruiting patients.

  Sponsor(s): National Institute of Allergy and Infectious Diseases (NIAID)

  Purpose - Excerpt: This protocol offers diagnosis and standard medical treatment for various parasitic gastrointestinal infections. Gastrointestinal parasites are either worms (helminths) or one-celled animals called protozoans which live in the human intestines. Often, parasitic infections do not cause illness. In these cases, drug treatment is not indicated, because treatment can have adverse side effects. Patients will be examined for their immune responses, correlation between the number of parasites and disease, and other studies. Individuals with known or suspected parasitic diseases of the gastrointestinal tract, including amebiasis, giardiasis, hookworm, strongyloidiasis, tricuriasis, pinworm, tapeworm, trichinosis, clonorchis, opisthorchis, coccidiosis,

[18] These are listed at **www.ClinicalTrials.gov**.

paragonimiasis, and echinococcus may be eligible for this study. Patient evaluations may include blood and urine tests, stool examination, X-rays, ultrasound studies and, uncommonly, duodenal aspiration for examination of fluid from the duodenum (first part of the small intestine). Other tests may be required, depending on the parasite and disease. Direct examination of the tissues of the intestines may be required to rule out certain infections. Research procedures include collection of stool, blood and duodenal fluid when the diagnosis has been established and these procedures are not required for medical care. Patients with strongyloidiasis may also be given a diagnostic skin test similar to skin tests for tuberculosis and allergies. Research procedures on children will be limited to collection of stool, urine and blood. No more than 7 milliliters (1 1/2 teaspoons) per kilogram (2.2 pounds) body weight of blood will be collected in children over a 6-week period. In adults no more than 30 tablespoons of blood will be collected in a 6-week period. Parasites may fail to respond to treatment. In these cases, it may be necessary to grow the parasite in the laboratory in order to test treatments in the test tube. Patients who do not respond to standard medications and dosing may need different doses of drugs or drugs or combinations of drugs used in the United States for other medical problems. If these medications or doses are used, patients will be informed of their possible side effects.

Study Type: Observational

Contact(s): Maryland; National Institute of Allergy and Infectious Diseases (NIAID), 9000 Rockville Pike Bethesda, Maryland, 20892, United States; Recruiting; Patient Recruitment and Public Liaison Office 1-800-411-1222 prpl@mail.cc.nih.gov; TTY 1-866-411-1010

Web Site:
http://clinicaltrials.gov/ct/gui/show/NCT00001162;jsessionid=FEE56639B3092125140A9FE542434719

Benefits and Risks[19]

What Are the Benefits of Participating in a Clinical Trial?

If you are interested in a clinical trial, it is important to realize that your participation can bring many benefits to you and society at large:

- A new treatment could be more effective than the current treatment for hookworm infection. Although only half of the participants in a clinical trial receive the experimental treatment, if the new treatment is proved to be more effective and safer than the current treatment, then those patients who did not receive the new treatment during the clinical trial may be among the first to benefit from it when the study is over.
- If the treatment is effective, then it may improve health or prevent diseases or disorders.
- Clinical trial patients receive the highest quality of medical care. Experts watch them closely during the study and may continue to follow them after the study is over.
- People who take part in trials contribute to scientific discoveries that may help other people with hookworm infection. In cases where certain diseases or disorders run in families, your participation may lead to better care or prevention for your family members.

The Informed Consent

Once you agree to take part in a clinical trial, you will be asked to sign an "informed consent." This document explains a clinical trial's risks and benefits, the researcher's expectations of you, and your rights as a patient.

What Are the Risks?

Clinical trials may involve risks as well as benefits. Whether or not a new treatment will work cannot be known ahead of time. There is always a chance that a new treatment may not work better than a standard treatment. There is also the possibility that it may be harmful. The treatment you receive may cause side effects that are serious enough to require medical attention.

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[19] This section has been adapted from ClinicalTrials.gov, a service of the National Institutes of Health:
http://www.clinicaltrials.gov/ct/gui/c/a1r/info/whatis?JServSessionIdzone_ct=9jmun6f291.

How Is Patient Safety Protected?

Clinical trials can raise fears of the unknown. Understanding the safeguards that protect patients can ease some of these fears. Before a clinical trial begins, researchers must get approval from their hospital's Institutional Review Board (IRB), an advisory group that makes sure a clinical trial is designed to protect patient safety. During a clinical trial, doctors will closely watch you to see if the treatment is working and if you are experiencing any side effects. All the results are carefully recorded and reviewed. In many cases, experts from the Data and Safety Monitoring Committee carefully monitor each clinical trial and can recommend that a study be stopped at any time. You will only be asked to take part in a clinical trial as a volunteer giving informed consent.

What Are a Patient's Rights in a Clinical Trial?

If you are eligible for a clinical trial, you will be given information to help you decide whether or not you want to participate. As a patient, you have the right to:

- Information on all known risks and benefits of the treatments in the study.
- Know how the researchers plan to carry out the study, for how long, and where.
- Know what is expected of you.
- Know any costs involved for you or your insurance provider.
- Know before any of your medical or personal information is shared with other researchers involved in the clinical trial.
- Talk openly with doctors and ask any questions.

After you join a clinical trial, you have the right to:

- Leave the study at any time. Participation is strictly voluntary. However, you should not enroll if you do not plan to complete the study.
- Receive any new information about the new treatment.
- Continue to ask questions and get answers.
- Maintain your privacy. Your name will not appear in any reports based on the study.

- Know whether you participated in the treatment group or the control group (once the study has been completed).

What about Costs?

In some clinical trials, the research facility pays for treatment costs and other associated expenses. You or your insurance provider may have to pay for costs that are considered standard care. These things may include inpatient hospital care, laboratory and other tests, and medical procedures. You also may need to pay for travel between your home and the clinic. You should find out about costs before committing to participation in the trial. If you have health insurance, find out exactly what it will cover. If you don't have health insurance, or if your insurance company will not cover your costs, talk to the clinic staff about other options for covering the cost of your care.

What Should You Ask before Deciding to Join a Clinical Trial?

Questions you should ask when thinking about joining a clinical trial include the following:

- What is the purpose of the clinical trial?
- What are the standard treatments for hookworm infection? Why do researchers think the new treatment may be better? What is likely to happen to me with or without the new treatment?
- What tests and treatments will I need? Will I need surgery? Medication? Hospitalization?
- How long will the treatment last? How often will I have to come back for follow-up exams?
- What are the treatment's possible benefits to my condition? What are the short- and long-term risks? What are the possible side effects?
- Will the treatment be uncomfortable? Will it make me feel sick? If so, for how long?
- How will my health be monitored?
- Where will I need to go for the clinical trial? How will I get there?
- How much will it cost to be in the study? What costs are covered by the study? How much will my health insurance cover?
- Will I be able to see my own doctor? Who will be in charge of my care?

- Will taking part in the study affect my daily life? Do I have time to participate?
- How do I feel about taking part in a clinical trial? Are there family members or friends who may benefit from my contributions to new medical knowledge?

Keeping Current on Clinical Trials

Various government agencies maintain databases on trials. The U.S. National Institutes of Health, through the National Library of Medicine, has developed ClinicalTrials.gov to provide patients, family members, and physicians with current information about clinical research across the broadest number of diseases and conditions.

The site was launched in February 2000 and currently contains approximately 5,700 clinical studies in over 59,000 locations worldwide, with most studies being conducted in the United States. ClinicalTrials.gov receives about 2 million hits per month and hosts approximately 5,400 visitors daily. To access this database, simply go to their Web site (**www.clinicaltrials.gov**) and search by "hookworm infection" (or synonyms).

While ClinicalTrials.gov is the most comprehensive listing of NIH-supported clinical trials available, not all trials are in the database. The database is updated regularly, so clinical trials are continually being added. The following is a list of specialty databases affiliated with the National Institutes of Health that offer additional information on trials:

- For clinical studies at the Warren Grant Magnuson Clinical Center located in Bethesda, Maryland, visit their Web site: **http://clinicalstudies.info.nih.gov/**
- For clinical studies conducted at the Bayview Campus in Baltimore, Maryland, visit their Web site: **http://www.jhbmc.jhu.edu/studies/index.html**
- For trials on infectious, immune, and allergic diseases, visit the site of the National Institute of Allergy and Infectious Diseases: **http://www.niaid.nih.gov/clintrials/**

General References

The following references describe clinical trials and experimental medical research. They have been selected to ensure that they are likely to be available from your local or online bookseller or university medical library. These references are usually written for healthcare professionals, so you may consider consulting with a librarian or bookseller who might recommend a particular reference. The following includes some of the most readily available references (sorted alphabetically by title; hyperlinks provide rankings, information and reviews at Amazon.com):

- **A Guide to Patient Recruitment : Today's Best Practices & Proven Strategies** by Diana L. Anderson; Paperback - 350 pages (2001), CenterWatch, Inc.; ISBN: 1930624115; **http://www.amazon.com/exec/obidos/ASIN/1930624115/icongroupinterna**
- **A Step-By-Step Guide to Clinical Trials** by Marilyn Mulay, R.N., M.S., OCN; Spiral-bound - 143 pages Spiral edition (2001), Jones & Bartlett Pub; ISBN: 0763715697; **http://www.amazon.com/exec/obidos/ASIN/0763715697/icongroupinterna**
- **The CenterWatch Directory of Drugs in Clinical Trials** by CenterWatch; Paperback - 656 pages (2000), CenterWatch, Inc.; ISBN: 0967302935; **http://www.amazon.com/exec/obidos/ASIN/0967302935/icongroupinterna**
- **The Complete Guide to Informed Consent in Clinical Trials** by Terry Hartnett (Editor); Paperback - 164 pages (2000), PharmSource Information Services, Inc.; ISBN: 0970153309; **http://www.amazon.com/exec/obidos/ASIN/0970153309/icongroupinterna**
- **Dictionary for Clinical Trials** by Simon Day; Paperback - 228 pages (1999), John Wiley & Sons; ISBN: 0471985961; **http://www.amazon.com/exec/obidos/ASIN/0471985961/icongroupinterna**
- **Extending Medicare Reimbursement in Clinical Trials** by Institute of Medicine Staff (Editor), et al; Paperback 1st edition (2000), National Academy Press; ISBN: 0309068886; **http://www.amazon.com/exec/obidos/ASIN/0309068886/icongroupinterna**
- **Handbook of Clinical Trials** by Marcus Flather (Editor); Paperback (2001), Remedica Pub Ltd; ISBN: 1901346293; **http://www.amazon.com/exec/obidos/ASIN/1901346293/icongroupinterna**

Vocabulary Builder

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

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]

Aspiration: The act of inhaling. [EU]

Coccidiosis: Protozoan infection found in animals and man. It is caused by several different genera of coccidia. [NIH]

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

Duodenum: The first or proximal portion of the small intestine, extending from the pylorus to the jejunum; so called because it is about 12 fingerbreadths in length. [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]

Helminths: Commonly known as parasitic worms, this group includes the acanthocephala, nematoda, and platyhelminths. Some authors consider certain species of leeches that can become temporarily parasitic as helminths. [NIH]

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

Protozoan: 1. any individual of the protozoa; protozoon. 2. of or pertaining to the protozoa; protozoal. [EU]

Strongyloidiasis: Infection with nematodes of the genus strongyloides. The presence of larvae may produce pneumonitis and the presence of adult worms in the intestine could lead to moderate to severe diarrhea. [NIH]

Trichinosis: A disease due to infection with trichinella spiralis. It is caused by eating undercooked meat, usually pork. [NIH]

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

PART II: ADDITIONAL RESOURCES AND ADVANCED MATERIAL

ABOUT PART II

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

CHAPTER 4. STUDIES ON HOOKWORM INFECTION

Overview

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

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

The Combined Health Information Database

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

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

- **Enterobius, Trichuris, Capillaria, and Hookworm Including Ancylostoma Caninum**

  Source: Gastroenterology Clinics of North America. 25(3): 579-597. September 1996.

  Contact: Available from W.B. Saunders Company, Periodicals Fulfillment, 6277 Sea Harbor Drive, Orlando, FL 32887. (800) 654-2452.

  Summary: This article reviews four groups of helminth: enterobius (pinworm), trichuris, capillaria, and hookworm, including ancylostoma caninum. The authors provide an overview of the epidemiology, clinical manifestation, and disease caused by the different parasites. They also highlight research that is providing new insights into both the biology of the host-parasite relationship and possible new approaches to infection management for the future. For each type of parasite, the authors describe symptoms and clinical effects of infection, diagnostic methods, and treatment options. 6 figures. 90 references.

Federally-Funded Research on Hookworm Infection

The U.S. Government supports a variety of research studies relating to hookworm infection and associated conditions. These studies are tracked by the Office of Extramural Research at the National Institutes of Health.[20] 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

[20] 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).

can perform targeted searches by various criteria including geography, date, as well as topics related to hookworm infection and related conditions.

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

- **Project Title: Cloning of a Hookworm Excretory-Secretory Protein**

  Principal Investigator & Institution: Bungiro, Richard D.; Epidemiology and Public Health; Yale University New Haven, Ct 06520

  Timing: Fiscal Year 2002; Project Start 0-MAR-2002

  Summary: provided by the candidate): Hookworms are a major global public health problem, infecting over a billion people worldwide. Blood feeding adult hookworms are a leading cause of anemia and malnutrition in developing countries, extracting a particularly devastating toll on children and women of childbearing age. Adult worms secrete numerous factors at the site of attachment in the intestine that are likely to contribute to disease pathogenesis. Accordingly, the initial aims of this project are the molecular cloning, expression, and characterization of AcES-1, a novel excretory-secretory protein which ahs been isolated from the human hookworm Ancylostoma ceylanicum. Using an animal model of hookworm infection the role of AcES-1 in pathogenesis will then be examined using active and passive immunization techniques. Aside from shedding light in the nature of the host-parasite interaction, study of factors such as AcES-1 may ultimately yield novel targets for immunological or pharmacological intervention to reduce the burden of hookworm disease.

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

- **Project Title: Hookworm Infections--Genetic Diversity and Recombinant Vaccine**

  Principal Investigator & Institution: Xiao, Shu-Hua; Chinese Academy of Preventive Medicine Preventive Medicine Shanghai,

  Timing: Fiscal Year 2000

  Summary: Based on a human parasite survey of almost 1.5 million people in China, our institute, The Institute of Parasitic Diseases of the Chinese

Academy of Preventive Medicine has determined that hookworm infection is a major public health threat to China (particularly in the provinces of the Yangtze River Basin). We estimate that 194 million people are infected with either Ancylostoma duodenale, Necator americanus, or both hookworm species, with up to 50 million cases of hookworm anemia (particularly among women and children). Current control measures that employ specific anthelminthic chemotherapy have been inadequate and unsatisfactory. Therefore we propose to implement modern and innovative biotechnology towards the study and control of human hookworm infection, which has become an important priority for our Ministry of Public Health. Our major focus for control will be molecular vaccine development. In collaboration with the Yale Medical Helminthology Laboratory we will initially examine two recombinant vaccine candidates cloned from A. caninum, directed against either the infective larval and adult blood-feeding stage. These vaccine candidates will be evaluated using our dog model of A. caninum infection, and will be followed by other recombinant polypeptides being developed jointly between our institute and Yale. In association with our Core, we will clone the corresponding molecules from Chinese human hookworm strains, in anticipation of Phase I testing. In order to lay the foundation for this work we will carry out an extensive genetic diversity analysis of the Chinese strains of A. duodenale and N. americanus. To determine the inter- and intra-specific genetic diversity among the two major genera of hookworms, we will employ several molecular techniques, including RAPD analysis and newly developed PCR-RFLP technology. This will allow us to identify regional differences between hookworm species and strains and to identify genetic variation in Chinese strain-specific vaccine candidate molecules.

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

- **Project Title: Hookworm Larval Infectivity and Development**

  Principal Investigator & Institution: Hotez, Peter J.; Associate Professor; Epidemiology and Public Health; Yale University New Haven, Ct 06520

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

  Summary: The mechanisms by which hookworm larvae infect almost one-fourth of the world's population and then develop in their human host are poorly understood. The proposed research will contribute to an understanding of these processes at the molecular level. After host entry, larvae of the genus Ancylostoma can exercise one of two developmental options that allows them to either (1) continue tissue invasion and development or (2) interrupt their development and undergo a

facultative growth arrest in the host tissues (hypobiosis). Arrested hypobiotic larvae are resistant to conventional anthelminthics and thus thwart traditional attempts at mass population chemotherapy when they enter the intestinal tract months after the initial infection. Moreover, larvae that arrest in a lactating mother can mobilize into breast milk to cause neonatal infection. New solutions to chemoprophylaxis or immunoprophylaxis are urgently needed; their design is dependent on elucidating the biochemical mechanisms that allow larvae to either invade tissue or arrest. To elucidate the basis for host invasion and development we will isolate the major hydrolases, an 49 kDa hyaluronidase that serves to degrade hyaluronic acid bridges connecting epidermal keratinocytes, and to facilitate dermal migration and a 68 kDa metalloprotease that also facilitates migration and appears to undergo post-translational processing during development. We will develop both antibody probes to these enzymes as well as nucleic acid probes wither by PCR or on the basis of N-terminal amino acid data. These probes will serve as reagents to identify cDNA clones from an expression library and to further explore our hypothesis that larval activation and development correlate biochemically with post-translational processing and phosphorylation. To elucidate the basis for arrest we will characterize protein kinase activities from infective larvae that serve as central components of signal transduction pathways and mediate developmental decisions. One of these a cAMP-dependent protein kinase, appears to mediate phosphorylation of a 68 kDa protein. A heterologous antibody to C. elegans cAMP-dependent protein kinase recognizes the hookworm protein on immunoblots and will be used as a reagent for screening a cDNA library. The pharmacologic manipulation of parasite-derived protein kinases may offer a new approach to chemotherapy by taking larvae out of arrest.

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

- **Project Title: The Molecular Pathogenesis of Hookworm Anemia**

  Principal Investigator & Institution: Cappello, Michael; Pediatrics; Yale University New Haven, Ct 06520

  Timing: Fiscal Year 2002; Project Start 1-APR-2002; Project End 1-MAR-2006

  Summary: (provided by the applicant): More than one billion people in developing countries are currently infected with blood feeding hookworms, intestinal nematodes that represent a leading cause of iron deficiency anemia in the world. The pathogenesis of hookworm anemia is a direct result of hemorrhage caused by the adult worm as it attaches to the intestinal mucosa. While it has been appreciated for nearly a century

that adult hookworms produce potent inhibitors of thrombosis, only recently have the molecular mechanisms underlying the parasite blood feeding process been elucidated. Potent inhibitors of coagulation and platelet function have been identified in soluble protein extracts and secretory products of the human hookworm parasite Ancylostoma ceylanicum. The anticoagulant has been cloned from adult A. ceylanicum RNA, and the recombinant protein inhibits the activity of coagulation factor Xa by a novel mechanism. The platelet inhibitor blocks the function of two important platelet integrins, glycoprotein Jib/lila (GPIIb/IIIa) and GPIa/Iia, which mediate platelet binding to fibrinogen and collagen, respectively. We hypothesize that these anti-thrombotics play a central role in the pathogenesis of hookworm anemia by facilitating blood feeding and exacerbating gastrointestinal hemorrhage. The mechanism of action of the hookworm factor Xa inhibitor will be characterized using in vitro studies of factor Xa binding, protease mediated inhibitor cleavage, and site directed mutagenesis. The platelet inhibitor will be purified and cloned from A. ceylanicum, and its mechanism of action will be characterized using in vitro assays of GPIa/Iia and GPIJb/iIIa integrin binding. Using a reproducible animal model of A.ceylanicum infection, the role of the anticoagulant and platelet inhibitor in the pathogenesis of hookworm anemia will be characterized using a vaccine-based approach. Animals will be immunized with each recombinant inhibitor, followed by challenge with 50 infectious L3 hookworm larvae. The responses to immunization will be monitored by ELISA, and the degree to which antibodies directed at the anti-thrombotics from A. ceylanicum protect against hookworm anemia and weight loss will be assessed using clinical parameters and worm burden measurements. These studies will ultimately determine the role of blood feeding in the pathogenesis of hookworm disease, as well as identify potential targets for a human vaccine against this globally important parasite.

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

- **Project Title: A Genome Scan for Susceptibility to Helminthic Infection**

  Principal Investigator & Institution: Williams-Blangero, Sarah A.; Scientist, Chair; Southwest Foundation for Biomedical Res Biomedical Research San Antonio, Tx 78227

  Timing: Fiscal Year 2000; Project Start 1-AUG-2000; Project End 1-JUL-2004

  Summary: (Verbatim From Applicant's Abstract): Helminthic infections are major public health concerns in both tropical and temperate areas of the world. Exciting new evidence suggests that genetic factors may play

important roles in determining susceptibility to infection for a number of these diseases. This project proposes a genomic scan to detect and localize the specific genes that influence susceptibility to infection with hookworm, roundworm, and whipworm in 1205 individuals belonging to the single largest pedigree of the Jirel population of eastern Nepal. Building upon 15 years of genetic research with the Jirel population, including three years of research on the genetic epidemiology of intestinal worm infections, this project will utilize the outstanding existing database and resource of helminthic infection data, blood samples, and pedigree information, to perform the first large-scale genomic scan for genes influencing susceptibility to these important diseases. We will use automated genotyping techniques to place STR markers every 10cM across the genome. We will then use state-of-the-art linkage analysis methods to detect genes influencing quantitative phenotypes associated with helminthic infection including initial egg counts and worm counts determined from stool samples collected for 96 hours following treatment with albendazole for hookworm, roundworm and whipworm. These helminthic infection phenotypes were determined at two points in time, in an initial survey and in a follow-up sample from 1 year after the initial survey. This project will provide new information about the genetic determinants of susceptibility to intestinal worm infections.

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

- **Project Title: A Genomic Approach to Parasites from the Phylum Nematoda**

  Principal Investigator & Institution: Waterston, Robert H.; Professor and Head; Genetics; Washington University Lindell and Skinker Blvd St. Louis, Mo 63130

  Timing: Fiscal Year 2000; Project Start 5-MAR-2000; Project End 8-FEB-2003

  Summary: Parasitic nematodes infect over half the world's human population, resulting in significant morbidity. Nematodes also attack livestock and cause over 80 billion dollars in crop damage annually. The essentially complete genome sequence of C. elegans offers a wealth of information about nematodes that could lead to new drugs, pesticides and vaccines. To expedite identification of genes from parasites which correspond to C. elegans, we propose a large-scale Expressed Sequence Tag (EST) sequencing effort that will target medically and economically important parasites from across the phylum Nematoda. ESTs have been demonstrated to provide a rapid partial inventory of an organism's genes for a fraction of the cost of a complete genome project. The objective of

this project is to generate and analyze a total of 125,000 ESTs from five key parasites: human hookworm (Necator americanus), two human intestinal works (Ascaris lumbricoides and Strongyloides stercoralis), a mouse intestinal worm (Trichuris muris), and soybean cyst nematode (Heterodera glycines). Specifically, the project will consist of generating directionally cloned cDNA libraries, obtaining ESTs from cDNA clones, and immediately submitting this data to the public databases. Homologues of C. elegans genes will be identified by BLAST, FASTA, and HMM techniques. Attention will be given to identifying proteins which have high similarity to C. elegans homologues but only weak similarity to non-nematode genomes. Such phyla-specific proteins are of interest, since they may serve as biochemical targets for the development of highly specific, non-toxic drugs and environmentally safe pesticides.

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

- **Project Title: Emerging Helminthiases in China**

  Principal Investigator & Institution: Feng, Zheng; Chinese Academy of Preventive Medicine Preventive Medicine Shanghai,

  Timing: Fiscal Year 2000; Project Start 5-JUN-1996; Project End 0-JUN-2002

  Summary: The Institute of Parasitic Diseases of the Chinese Academy of Preventive Medicine has recently completed a four year nationwide survey of parasitic infections among almost 1.5 million individuals in every Province of P.R. China. Striking findings from the study were 1) the apparent emergence of hookworm infection and paragonimiasis superimposed on an alarming prevalence of schistosomiasis japonica, particularly in high population density areas of the Yangtze River Basin and 2) the unsatisfactory effectiveness of traditional control methods that rely on broad spectrum anthelminthics. We propose to employ modern and innovative biotechnology for the study and control of these three major helminthiases in the Yangtze River Basin. Our Institute has assembled teams of parasitologists, molecular biologists and immunologists/vaccinologists to collaborate with U.S. and Australian institutions on two fronts. The first approach proposes to develop molecular vaccines (recombinant polypeptides and DNA vaccines) against all three helminthiases. We are currently testing a promising recombinant anti-disease vaccine candidate against schistosomiasis japonica that was genetically engineered at our Institute, with several other candidates in active development. We are also testing two recombinant anti-disease vaccine candidates for hookworm infection that were genetically engineered at Yale. A major thrust of the proposal will be to research and develop additional vaccine candidates jointly with our

foreign collaborators. The second approach will be to determine the extent of genetic diversity among the Chinese strains of these helminths and their vectors. For this, we will build on a well developed collaboration with the Academy of Natural Sciences in Philadelphia through our recently established Chinese Center of Systematic Medical Malacology. Using RAPD, RFLP and single copy cDNA sequencing we will uncover inter- and infraspecific genetic diversity and/or cryptic species. These techniques have already revealed unique Chinese strains among the S. japonicum complex and Paragonimus spp., and will help us to examine the impact of a major Yangtze civil engineering project, the Three Gorges Dam, on helminth/vector emergence. Ultimately, the extent of genetic diversity will have a bearing on the development of molecular vaccine candidates that cover widely divergent Chinese strains.

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

E-Journals: PubMed Central[21]

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).[22] Access to this growing archive of e-journals is free and unrestricted.[23] To search, go to **http://www.pubmedcentral.nih.gov/index.html#search**, and type "hookworm infection" (or synonyms) into the search box. This search gives you access to full-text articles. The following is a sample of items found for hookworm infection in the PubMed Central database:

- **Ancylostoma Caninum Anticoagulant Peptide: A Hookworm-Derived Inhibitor of Human Coagulation Factor Xa** by M Cappello, GP Vlasuk, PW Bergum, S Huang, and PJ Hotez; 1995 June 20 http://www.pubmedcentral.nih.gov/articlerender.fcgi?rendertype=abstract&artid=41660
- **Anticoagulant Repertoire of the Hookworm Ancylostoma caninum** by P Stanssens, PW Bergum, Y Gansemans, L Jespers, Y Laroche, S Huang, S

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

[22] 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.

[23] 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.

Maki, J Messens, M Lauwereys, M Cappello, PJ Hotez, I Lasters, and GP Vlasuk; 1996 March 5
http://www.pubmedcentral.nih.gov/articlerender.fcgi?rendertype=abstract&artid=39925

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

- **The influence of temperature and osmotic stress on the development and eclosion of hookworm eggs.**
  Author(s): Matthews BE.
  Source: Journal of Helminthology. 1985 September; 59(3): 217-24.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3934257&dopt=Abstract

- **Effect of ingested garlic on Necator americanus and Ancylostoma caninum.**
  Author(s): Bastidas GJ.

[24] 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.

Source: Am J Trop Med Hyg. 1969 November; 18(6): 920-3. No Abstract Available.
http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=5389769&dopt=Abstract

Vocabulary Builder

Anaemia: A reduction below normal in the number of erythrocytes per cu. mm., in the quantity of haemoglobin, or in the volume of packed red cells per 100 ml. of blood which occurs when the equilibrium between blood loss (through bleeding or destruction) and blood production is disturbed. [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 ode of action as agglutinins, bacteriolysins, haemolysins, opsonins, precipitins, etc. [EU]

Ascaris: A genus of nematodes of the superfamily ascaridoidea whose species usually inhabit the intestine. [NIH]

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

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

Capillaria: A genus of trichuroid nematodes parasitic in the liver and intestines of many mammals and birds. Two species, C. hepatica and C. philippinensis, produce often fatal infections in man. [NIH]

Chemotherapy: The treatment of disease by means of chemicals that have a specific toxic effect upon the disease - producing microorganisms or that selectively destroy cancerous tissue. [EU]

Coagulation: 1. the process of clot formation. 2. in colloid chemistry, the solidification of a sol into a gelatinous mass; an alteration of a disperse phase or of a dissolved solid which causes the separation of the system into a liquid phase and an insoluble mass called the clot or curd. Coagulation is usually irreversible. 3. in surgery, the disruption of tissue by physical means to form an amorphous residuum, as in electrocoagulation and photocoagulation. [EU]

Collagen: The protein substance of the white fibres (collagenous fibres) of skin, tendon, bone, cartilage, and all other connective tissue; composed of molecules of tropocollagen (q.v.), it is converted into gelatin by boiling.

collagenous pertaining to collagen; forming or producing collagen. [EU]

Cyst: Any closed cavity or sac; normal or abnormal, lined by epithelium, and especially one that contains a liquid or semisolid material. [EU]

Enterobius: A genus of intestinal nematode worms which includes the pinworm or threadworm Enterobius vermicularis. [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]

Eosinophils: Granular leukocytes with a nucleus that usually has two lobes connected by a slender thread of chromatin, and cytoplasm containing coarse, round granules that are uniform in size and stainable by eosin. [NIH]

Epidermal: Pertaining to or resembling epidermis. Called also epidermic or epidermoid. [EU]

Glycine: A non-essential amino acid. It is found primarily in gelatin and silk fibroin and used therapeutically as a nutrient. It is also a fast inhibitory neurotransmitter. [NIH]

Hemorrhage: Bleeding or escape of blood from a vessel. [NIH]

Immunization: The induction of immunity. [EU]

Isosporiasis: Infection with parasitic protozoa of the genus isospora, producing intestinal disease. It is caused by ingestion of oocysts and can produce tissue cysts. [NIH]

Mediate: Indirect; accomplished by the aid of an intervening medium. [EU]

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

Mucosa: A mucous membrane, or tunica mucosa. [EU]

Mutagenesis: Process of generating genetic mutations. It may occur spontaneously or be induced by mutagens. [NIH]

Nematoda: A class of unsegmented helminths with fundamental bilateral symmetry and secondary triradiate symmetry of the oral and esophageal structures. Many species are parasites. [NIH]

Neonatal: Pertaining to the first four weeks after birth. [EU]

Osmotic: Pertaining to or of the nature of osmosis (= the passage of pure solvent from a solution of lesser to one of greater solute concentration when the two solutions are separated by a membrane which selectively prevents the passage of solute molecules, but is permeable to the solvent). [EU]

Paragonimus: A genus of lung flukes of the family Troglotrematidae. This genus consists of several species one of which is P. westermani, a common lung fluke in man. Members of this and other species also occur in other mammals. [NIH]

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

Phenotype: The outward appearance of the individual. It is the product of interactions between genes and between the genotype and the environment. This includes the killer phenotype, characteristic of yeasts. [NIH]

Phosphorylation: The introduction of a phosphoryl group into a compound through the formation of an ester bond between the compound and a phosphorus moiety. [NIH]

Polypeptide: A peptide which on hydrolysis yields more than two amino acids; called tripeptides, tetrapeptides, etc. according to the number of amino acids contained. [EU]

Prevalence: The total number of cases of a given disease in a specified population at a designated time. It is differentiated from incidence, which refers to the number of new cases in the population at a given time. [NIH]

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

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

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

Strongyloides: A genus of parasitic nematodes widely distributed as intestinal parasites of mammals. [NIH]

Thrombosis: The formation, development, or presence of a thrombus. [EU]

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

Trichuris: A genus of nematode worms comprising the whipworms. [NIH]

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

CHAPTER 5. BOOKS ON HOOKWORM INFECTION

Overview

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

Book Summaries: Online Booksellers

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

The National Library of Medicine Book Index

The National Library of Medicine at the National Institutes of Health has a massive database of books published on healthcare and biomedicine. Go to

the following Internet site, **http://locatorplus.gov/**, and then select "Search LOCATORplus." Once you are in the search area, simply type "hookworm infection" (or synonyms) into the search box, and select "books only." From there, results can be sorted by publication date, author, or relevance. The following was recently catalogued by the National Library of Medicine:[25]

- **As I recall; the hookworm campaigns initiated by the Rockefeller Sanitary Commission and the Rockefeller Foundation in the Southern United States and tropical America.** Author: Washburn, Benjamin Earle, 1885-; Year: 1960; New York, Office of Publications, Rockefeller Foundation [c1960]
- **Bibliography of hookworm disease (ancylostomiasis) 1920-1962. Bibliographie de l'ankylostomiase, 1920-1962.** Author: World Health Organization; Year: 1965; Genève, 1965
- **Bibliography of hookworm disease ...** Author: Rockefeller Foundation. International Health Board; Year: 1922; New York city, The Rockefeller foundation, International health board, 1922
- **Colonialism, tropical disease, and imperial medicine: Rockefeller philanthropy in Sri Lanka.** Author: Soma Hewa; Year: 1995; Lanham, Md.: University Press of America, c1995; ISBN: 0819199397 (cloth: alk. paper)
  http://www.amazon.com/exec/obidos/ASIN/0819199397/icongroupinterna
- **Control of hookworm disease by the intensive method.** Author: Howard, Hector Holdbrook, 1873-; Year: 1919; New York, Rockefeller Foundation, International Health Board, 1919
- **Control of hookworm infection at the deep gold mines of the Mother Lode, California.** Author: by James G. Cumming and Joseph H. White; Year: 1917; Washington: Govt. Print. Off., 1917
- **Effects of hookworm disease on the mental and physical development of children.** Author: Strong, Edward Kellogg, 1884-; Year: 1916; New York, Rockefeller Foundation, 1916

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[25] 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.**

- **Final report of the survey of hookworm infection, general sanitary conditions, and organized health work in the Straits Settlements.** Author: by M.E. Barnes, Paul F. Russell; Year: 1925; Singapore: International Health Board of the Rockefeller Foundation, [1925]
- **Geohelminths: ascaris, trichuris, and hookworm.** Author: edited by Celia V. Holland and Malcolm W. Kennedy; Year: 2002; Boston: Kluwer Academic Publishers, c2002; ISBN: 0792375572 (alk. paper) http://www.amazon.com/exec/obidos/ASIN/0792375572/icongroupinterna
- **Hookworm and malaria research in Malaya, Java, and the Fiji Islands; report of Uncinariasis Commission to the Orient, 1915-1917 [by] S. T. Darling [and others].** Author: Rockefeller Foundation. International Health Board. Uncinariasis Commission to the Orient, 1915-1917; Year: 1920; New York, 1920
- **Hookworm disease: current status and new directions.** Author: edited by G.A. Schad and K.S. Warren; Year: 1990; London; New York: Taylor ; Francis, 1990; ISBN: 0850667623 http://www.amazon.com/exec/obidos/ASIN/0850667623/icongroupinterna
- **Hookworm disease among cotton-mill operatives.** Author: Stiles, Charles Wardell, 1867-1941; Year: 1912; Washington, D.C.: Government Printing Office, 1912
- **Hookworm disease, a handbook of information for all who are interested. Prepared by Hiram Byrd.** Author: Florida. State Board of Health; Year: 1912; DeLand, 1912
- **Hookworm disease; etiology, pathology, diagnosis, prognosis, prophylaxis, and treatment, by George Dock ... and Charles C. Bass ... illustrated with forty-nine special engravings and colored plate.** Author: Dock, George, 1860-; Year: 1910; St. Louis, C. V. Mosby company, 1910
- **Hookworm disease; its distribution, biology, epidemiology, pathology, diagnosis, treatment and control, by Asa C. Chandler ...** Author: Chandler, Asa Crawford, 1891-; Year: 1929; New York, The Macmillan company, 1929
- **Hookworm disease; its ravages, prevention and cure [by] John A. Ferrell.** Author: Rockefeller Sanitary Commission for the Eradication of Hookworm Disease; Year: 1915; Washington, Rockefeller Sanitary Commission, 1915
- **Hookworm doctor; the life story of Dr. C. F. Strosnider, a practicing physician for over a half a century.** Author: Rountree, Moses; Year: 1967; Goldsboro, N. C., Nash [1967?]

- **Hookworm eradication program in the South, 1909-1925. Athens, Ga., 1970.** Author: Farmer, Harry Frank, 1941-; Year: 1972; [Ann Arbor, Mich., University Microfilms, 1972]
- **Hookworm infection and anaemia: approaches to prevention and control.** Author: Z.S. Pawlowski, G.A. Schad, G.J. Stott; Year: 1991; Geneva: World Health Organization, 1991; ISBN: 9241544155 http://www.amazon.com/exec/obidos/ASIN/9241544155/icongroupinterna
- **Hookworm infection in India: with notes on symptoms, treatment & prophylaxis.** Author: by P.A. Maplestone and A.K. Mukerji; revised by S. Pattanayak and D.N. Dhar; Year: 1968; Delhi: Manager of Publications, 1968
- **Hookworm infection, by Clayton Lane ...** Author: Lane, Clayton Arbuthnot, 1868-; Year: 1932; London, New York [etc.] H. Milford, Oxford university press, 1932
- **Hookworm infections.** Author: edited by H.M. Gilles and P.A.J. Ball; Year: 1991; Amsterdam; New York: Elsevier; New York, NY, USA: Sole distributors for the U.S.A. and Canada, Elsevier Science Pub. Co., 1991; ISBN: 0444812431 http://www.amazon.com/exec/obidos/ASIN/0444812431/icongroupinterna
- **Relief and control of hookworm disease in Nicaragua, from September 22, 1915 to December 31, 1919.** Author: Molloy, Daniel Murrah, 1882-; Year: 1920; New York, International Health Board, 1920
- **Report of the WHO Informal Consultation on Hookworm Infection and Anaemia in Girls and Women, Geneva, 5-7 December 1994.** Author: WHO Informal Consultation on Hookworm Infection and Anaemia in Girls and Women (1994: Geneva, Switzerland); Year: 1994; [Geneva?]: Programme of Intestinal Parasitic Infections, Division of Communicable Diseases, [1995]
- **Researches on hookworm in China, embodying the results of the work of the China hookworm commission, June, 1923 to November, 1924, by W. W. Cort, J. B. Grant, N. R. Stoll and other collaborators.** Author: Cort, William Walter, 1887-; Year: 1926; Baltimore, Md., 1926
- **Uncinariasis (Hookworm disease) in Porto Rico: a medical and economic problem, by Bailey K. Ashford ... and Pedro Gutierrez Igaravidez ... members of the former Porto Rico anemia commission, San Juan, Porto Rico, August 5, 1910.** Author: Ashford, Bailey Kelly, 1873-1934; Year: 1911; Washington, Govt. print. off., 1911

Chapters on Hookworm Infection

Frequently, hookworm infection will be discussed within a book, perhaps within a specific chapter. In order to find chapters that are specifically dealing with hookworm infection, an excellent source of abstracts is the Combined Health Information Database. You will need to limit your search to book chapters and hookworm infection using the "Detailed Search" option. Go 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 "hookworm infection" (or synonyms) into the "For these words:" box, you will only receive results on chapters in books.

General Home References

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

- **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**
- **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**
- **Plague Time: How Stealth Infections Are Causing Cancers, Heart Disease, and Other Deadly Ailments** by Paul W. Ewald; Hardcover - 288 pages (November 2000), Free Press; ISBN: 0684869004; **http://www.amazon.com/exec/obidos/ASIN/0684869004/icongroupinterna**

Vocabulary Builder

Ancylostomiasis: Infection of humans or animals with hookworms of the genus ancylostoma. Characteristics include anemia, dyspepsia, eosinophilia, and abdominal swelling. [NIH]

CHAPTER 6. MULTIMEDIA ON HOOKWORM INFECTION

Overview

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

Bibliography: Multimedia on Hookworm Infection

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

- **Hookworm infection.** Source: William F. Myers; produced by the Dept. of Microbiology and the Office of Medical Education, University of Maryland, School of Medicine; Year: 1978; Format: Slide; Baltimore: University Park Press, c1978
- **Infective larvae of Ancylostoma caninum.** Source: Communicable Disease Center; Year: 1952; Format: Motion picture; [Atlanta]: The Center: [for loan by National Medical Audiovisual Center; Washington: for sale by National Audiovisual Center, 1952?]

CHAPTER 7. 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.[26] 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:[27]

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

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

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

While all of the above references may be of interest to physicians who study and treat hookworm infection, 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 hookworm infection 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 "hookworm infection" (or synonyms)

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

- **Parasitic Diseases of the Liver and Intestines**

  Source: Gastroenterology Clinics of North America. 25(3): 435-715. September 1996.

  Contact: Available from W.B. Saunders Company, Periodicals Fulfillment, 6277 Sea Harbor Drive, Orlando, FL 32887. (800) 654-2452.

  Summary: This issue of Gastroenterology Clinics reviews the epidemiology, lifecycle, diagnosis, and treatment of parasites that inhabit the liver and intestines of humans. It also reviews the pathophysiology of the host-parasite interaction. Twelve articles cover the approach to stool examination for parasites; preparing the international traveler; amebiasis; giardiasis; American typanosomiasis (Chagas' disease); visceral leishmaniasis; ascariasis; enterobius, trichuris, capillaria, and hookworm, including ancylostoma caninum; the pathophysiology, diagnosis and treatment of schistosomiasis; liver and intestinal flukes; tapeworms (cestodiasis); echinococcus; and parasitic diseases in immunocompromised hosts, particularly cryptosporidiosis, isosporiasis, and strongyloidiasis. The authors provide a series of concise summaries as well as new and important information regarding enteric parasitic infections. A subject index concludes the volume.

The NLM Gateway[28]

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.[29] 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.[30] To use the NLM Gateway, simply go to the search site at

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

[29] 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).

[30] 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

http://gateway.nlm.nih.gov/gw/Cmd. Type "hookworm infection" (or synonyms) into the search box and click "Search." The results will be presented in a tabular form, indicating the number of references in each database category.

Results Summary

Category	Items Found
Journal Articles	347265
Books / Periodicals / Audio Visual	2573
Consumer Health	294
Meeting Abstracts	3093
Other Collections	100
Total	353325

HSTAT[31]

HSTAT is a free, Web-based resource that provides access to full-text documents used in healthcare decision-making.[32] 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.[33] Simply search by "hookworm infection" (or synonyms) at the following Web site: **http://text.nlm.nih.gov**.

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the Gateway as an adjunct tool to other NLM search services such as PubMed® and MEDLINEplus®. The Gateway connects users with multiple NLM retrieval systems while also providing a search interface for its own collections. These collections include various types of information that do not logically belong in PubMed, LOCATORplus, or other established NLM retrieval systems (e.g., meeting announcements and pre-1966 journal citations). The Gateway will provide access to the information found in an increasing number of NLM retrieval systems in several phases.

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

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

[33] 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

Coffee Break: Tutorials for Biologists[34]

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.[35] 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.[36] This site has new articles every few weeks, so it can be considered an online magazine of sorts, and intended for general background information. You can access the Coffee Break Web site at **http://www.ncbi.nlm.nih.gov/Coffeebreak/**.

Other Commercial Databases

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

- **CliniWeb International:** Index and table of contents to selected clinical information on the Internet; see **http://www.ohsu.edu/cliniweb/**.
- **Image Engine:** Multimedia electronic medical record system that integrates a wide range of digitized clinical images with textual data stored in the University of Pittsburgh Medical Center's MARS electronic medical record system; see the following Web site: **http://www.cml.upmc.edu/cml/imageengine/imageEngine.html**.
- **Medical World Search:** Searches full text from thousands of selected medical sites on the Internet; see **http://www.mwsearch.com/**.

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independent, nonfederal Task Force on Community Services *Guide to Community Preventive Services*; and the Health Technology Advisory Committee (HTAC) of the Minnesota Health Care Commission (MHCC) health technology evaluations.

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

[35] 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.

[36] 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 hookworm infection (sorted alphabetically by title, hyperlinks provide rankings, information, and reviews at Amazon.com):

- **2002 Pocket Book of Infectious Disease Therapy** by John G. Bartlett; Paperback - 348 pages, 11th edition (November 15, 2001), Lippincott, Williams & Wilkins Publishers; ISBN: 0781734320; **http://www.amazon.com/exec/obidos/ASIN/0781734320/icongroupinterna**
- **Concepts in Microbiology, Immunology, & Infectious Disease: A Review for the Usmle Step 1 (Usmle Concepts Series)** by Kapil Gupta; Paperback (May 1997), CRC Press-Parthenon Publishers; ISBN: 1850707979; **http://www.amazon.com/exec/obidos/ASIN/1850707979/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**

- **Infectious Diseases Diagnosis : Current Status and Future Trends (Parasitology, 117)** by H. V. Smith (Editor), et al; Paperback - 218 pages (August 2000), Cambridge University Press; ISBN: 0521785073; **http://www.amazon.com/exec/obidos/ASIN/0521785073/icongroupinterna**
- **Infectious Diseases and Arthropods** by Jerome Goddard; Hardcover - 240 pages (November 1999), Humana Press; ISBN: 0896038254; **http://www.amazon.com/exec/obidos/ASIN/0896038254/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**
- **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**
- **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**
- **Tropical Medicine and Parasitology** by Wallace Peters, Geoffrey Pasvol; Paperback - 334 pages, 5th edition (January 15, 2002), Mosby-Year Book; ISBN: 0723431914; **http://www.amazon.com/exec/obidos/ASIN/0723431914/icongroupinterna**

Vocabulary Builder

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]

CHAPTER 8. DISSERTATIONS ON HOOKWORM INFECTION

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 hookworm infection. 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 Hookworm Infection

ProQuest Digital Dissertations is the largest archive of academic dissertations available. From this archive, we have compiled the following list covering dissertations devoted to hookworm infection. 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 hookworm infection:

- **Molecular Cloning and Characterization of a Developmentally Regulated Gut Luminal Metallopeptidase from Adult Ancylostoma Caninum Hookworm** by James, Brian Francis; Phd from Yale University, 2001, 195 pages
  http://wwwlib.umi.com/dissertations/fullcit/3030785
- **The Hookworm Eradication Program in the South, 1909-1925** by Farmer, Harry Frank, Jr., Phd from University of Georgia, 1970, 164 pages
  http://wwwlib.umi.com/dissertations/fullcit/7103730

Keeping Current

As previously mentioned, an effective way to stay current on dissertations dedicated to hookworm infection 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 hookworm infection and related conditions.

APPENDIX A. RESEARCHING YOUR MEDICATIONS

Overview

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

Your Medications: The Basics[37]

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

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

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

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

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

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

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

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

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

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

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

Learning More about Your Medications

Because of historical investments by various organizations and the emergence of the Internet, it has become rather simple to learn about the medications your doctor has recommended for hookworm infection. One such source is the United States Pharmacopeia. In 1820, eleven physicians met in Washington, D.C. to establish the first compendium of standard drugs for the United States. They called this compendium the "U.S. Pharmacopeia (USP)." Today, the USP is a non-profit organization consisting of 800 volunteer scientists, eleven elected officials, and 400 representatives of state associations and colleges of medicine and pharmacy. The USP is located in Rockville, Maryland, and its home page is located at **www.usp.org**. The USP currently provides standards for over 3,700 medications. The resulting USP DI® Advice for the Patient® can be accessed through the National Library of Medicine of the National Institutes of Health. The database is partially derived from lists of federally approved medications in the Food and Drug Administration's (FDA) Drug Approvals database.[38]

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

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 hookworm infection. 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 hookworm infection:

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

Albendazole

- **Systemic - U.S. Brands:** Albenza; Eskazole; Zentel
  http://www.nlm.nih.gov/medlineplus/druginfo/albendazolesystemic202668.html

Ivermectin

- **Systemic - U.S. Brands:** Stromectol
  http://www.nlm.nih.gov/medlineplus/druginfo/ivermectinsystemic202311.html

Mebendazole

- **Systemic - U.S. Brands:** Vermox
  http://www.nlm.nih.gov/medlineplus/druginfo/mebendazolesystemic202339.html

Pyrantel

- **Oral - U.S. Brands:** Pin-X
  http://www.nlm.nih.gov/medlineplus/druginfo/pyranteloral202490.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**.[39]

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

[39] Adapted from *A to Z Drug Facts* by Facts and Comparisons.

provides prescribing information, drug interactions, and patient information. Information can be obtained at the following hyperlink: **http://www.genrx.com/Mosby/PhyGenRx/group.html**.

Physicians Desk Reference

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

Other Web Sites

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

Contraindications and Interactions (Hidden Dangers)

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

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

Be sure to read the label every time you use a nonprescription or prescription drug, and take the time to learn about drug interactions. These

precautions may be critical to your health. You can reduce the risk of potentially harmful drug interactions and side effects with a little bit of knowledge and common sense.

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

A Final Warning

At some point, you may hear of alternative medications from friends, relatives, or in the news media. Advertisements may suggest that certain alternative drugs can produce positive results for patients with hookworm infection. Exercise caution--some of these drugs may have fraudulent claims, and others may actually hurt you. The Food and Drug Administration (FDA) is the official U.S. agency charged with discovering which medications are likely to improve the health of patients with hookworm infection. The FDA warns patients to watch out for[40]:

- 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**.

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[40] 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):

- **Approaches to Design and Synthesis of Antiparasitic Drugs** by Satyavan Sharma, et al; Hardcover - 524 pages (October 1, 1997), Elsevier Science; ISBN: 0444894764; **http://www.amazon.com/exec/obidos/ASIN/0444894764/icongroupinterna**
- **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**

Vocabulary Builder

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

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

Mebendazole: A nematocide in humans and animals. It acts by interfering with the carbohydrate metabolism and associated energy production of the parasite. [NIH]

Systemic: Pertaining to or affecting the body as a whole. [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 hookworm infection. Finally, at the conclusion of this chapter, we will provide a list of readings on hookworm infection from various authors. We will begin, however, with the National Center for Complementary and Alternative Medicine's (NCCAM) overview of complementary and alternative medicine.

What Is CAM?[41]

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

[41] 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?[42]

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

[42] 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.[43]

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

Is It Okay to Want Both Traditional and Alternative Medicine?

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

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

Finding CAM References on Hookworm Infection

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

National Center for Complementary and Alternative Medicine

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

- **Eotaxin is specifically cleaved by hookworm metalloproteases preventing its action in vitro and in vivo.**
  Author(s): Culley FJ, Brown A, Conroy DM, Sabroe I, Pritchard DI, Williams TJ.

Source: Journal of Immunology (Baltimore, Md. : 1950). 2000 December 1; 165(11): 6447-53.
http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11086084&dopt=Abstract

- **Hookworm disease: Puerto Rico's secret killer.**
  Author(s): Maldonado AE.
  Source: P R Health Sci J. 1993 September; 12(3): 191-6.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=8272486&dopt=Abstract

- **Hookworm infection and iron-deficiency anaemia in Durban.**
  Author(s): Mayet FG, Powell SJ.
  Source: South African Medical Journal. Suid-Afrikaanse Tydskrif Vir Geneeskunde. 1966 March 19; 40(11): 244-6. No Abstract Available.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=5908959&dopt=Abstract

- **Hookworm infection in Dutch servicemen returning from West New Guinea.**
  Author(s): Anten JF, Zuidema PJ.
  Source: Trop Geogr Med. 1964 September; 64(756): 216-24. No Abstract Available.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=5895548&dopt=Abstract

- **Isolation and characterization of a proteolytic enzyme from the adult hookworm Ancylostoma caninum.**
  Author(s): Hotez PJ, Trang NL, McKerrow JH, Cerami A.
  Source: The Journal of Biological Chemistry. 1985 June 25; 260(12): 7343-8.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3888998&dopt=Abstract

- **Preliminary analysis of the proteolytic enzymes in the excretory-secretory products of the adult stages of the dog hookworm Uncinaria stenocephala.**
  Author(s): Kotomski G, Wedrychowicz H.
  Source: Parasite. 2001 March; 8(1): 67-70.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=11304953&dopt=Abstract

- **The influence of temperature and osmotic stress on the development and eclosion of hookworm eggs.**
  Author(s): Matthews BE.
  Source: Journal of Helminthology. 1985 September; 59(3): 217-24.
  http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=3934257&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 hookworm; 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**

Ascariasis
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Guinea Worm Disease
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Hookworm
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Loiasis
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Lymphatic Filariasis
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Parasites
Source: Healthnotes, Inc.; www.healthnotes.com
Hyperlink: http://www.thedacare.org/healthnotes/Concern/Parasites.htm

Parasitic Infection, Roundworms
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Pinworm
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

River Blindness
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Roundworms
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Threadworm
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Trichinosis
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Visceral Larva Migrans
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

Whipworm
Source: Integrative Medicine Communications; www.onemedicine.com
Hyperlink: http://www.drkoop.com/interactivemedicine/ConsConditions/Roundwormscc.html

- **Herbs and Supplements**

Anthelmintics
Source: Healthnotes, Inc.; www.healthnotes.com
Hyperlink: http://www.thedacare.org/healthnotes/Drug/Anthelmintics.htm

Elecampane
Alternative names: Inula helenium
Source: Healthnotes, Inc.; www.healthnotes.com
Hyperlink: http://www.thedacare.org/healthnotes/Herb/Elecampane.htm

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):

- **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**
- **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**
- **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:

Anthelmintics: Agents destructive to parasitic worms. They are used therapeutically in the treatment of helminthiasis in man and animal. [NIH]

Berberine: An alkaloid from Hydrastis canadensis L., Berberidaceae. It is also found in many other plants. It is relatively toxic parenterally, but has been used orally for various parasitic and fungal infections and as antidiarrheal. [NIH]

Filariasis: Infections with nematodes of the superfamily filarioidea. The presence of living worms in the body is mainly asymptomatic but the death of adult worms leads to granulomatous inflammation and permanent fibrosis. Organisms of the genus Elaeophora infect wild elk and domestic sheep causing ischaemic necrosis of the brain, blindness, and dermatosis of the face. [NIH]

Hypersensitivity: A state of altered reactivity in which the body reacts with an exaggerated immune response to a foreign substance. Hypersensitivity reactions are classified as immediate or delayed, types I and IV, respectively, in the Gell and Coombs classification (q.v.) of immune responses. [EU]

Intramuscular: Within the substance of a muscle. [EU]

Psychology: The science dealing with the study of mental processes and behavior in man and animals. [NIH]

Riboflavin: Nutritional factor found in milk, eggs, malted barley, liver, kidney, heart, and leafy vegetables. The richest natural source is yeast. It

occurs in the free form only in the retina of the eye, in whey, and in urine; its principal forms in tissues and cells are as FMN and FAD. [NIH]

Schistosoma: A genus of trematode flukes belonging to the family Schistosomatidae. There are over a dozen species. These parasites are found in man and other mammals. Snails are the intermediate hosts. [NIH]

Tubulin: A microtubule subunit protein found in large quantities in mammalian brain. It has also been isolated from sperm flagella, cilia, and other sources. Structurally, the protein is a dimer with a molecular weight of approximately 120,000 and a sedimentation coefficient of 5.8S. It binds to colchicine, vincristine, and vinblastine. [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 hookworm infection. Any dietary recommendation is based on a patient's age, body mass, gender, lifestyle, eating habits, food preferences, and health condition. It is therefore likely that different patients with hookworm infection may be given different recommendations. Some recommendations may be directly related to hookworm infection, while others may be more related to the patient's general health. These recommendations, themselves, may differ from what official sources recommend for the average person.

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

Food and Nutrition: General Principles

What Are Essential Foods?

Food is generally viewed by official sources as consisting of six basic elements: (1) fluids, (2) carbohydrates, (3) protein, (4) fats, (5) vitamins, and (6) minerals. Consuming a combination of these elements is considered to be a healthy diet:

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

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

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

nutrients; food sources for riboflavin include dairy products, leafy vegetables, meat, and eggs.

- **Vitamin B^3**, also known as niacin, is important for healthy skin and helps the body use energy; food sources for niacin include peas, peanuts, fish, and whole grains
- **Vitamin B^6**, also known as pyridoxine, is important for the regulation of cells in the nervous system and is vital for blood formation; food sources for pyridoxine include bananas, whole grains, meat, and fish.
- **Vitamin B^{12}** is vital for a healthy nervous system and for the growth of red blood cells in bone marrow; food sources for vitamin B^{12} include yeast, milk, fish, eggs, and meat.
- **Vitamin C** allows the body's immune system to fight various diseases, strengthens body tissue, and improves the body's use of iron; food sources for vitamin C include a wide variety of fruits and vegetables.
- **Vitamin D** helps the body absorb calcium which strengthens bones and teeth; food sources for vitamin D include oily fish and dairy products.
- **Vitamin E** can help protect certain organs and tissues from various degenerative diseases; food sources for vitamin E include margarine, vegetables, eggs, and fish.
- **Vitamin K** is essential for bone formation and blood clotting; common food sources for vitamin K include leafy green vegetables.
- **Folic Acid** maintains healthy cells and blood and, when taken by a pregnant woman, can prevent her fetus from developing neural tube defects; food sources for folic acid include nuts, fortified breads, leafy green vegetables, and whole grains.

It should be noted that one can overdose on certain vitamins which become toxic if consumed in excess (e.g. vitamin A, D, E and K).
Like vitamins, minerals are chemicals that are required by the body to remain in good health. Because the human body does not manufacture these chemicals internally, we obtain them from food and other dietary sources. The more important minerals include:

- **Calcium** is needed for healthy bones, teeth, and muscles, but also helps the nervous system function; food sources for calcium include dry beans, peas, eggs, and dairy products.
- **Chromium** is helpful in regulating sugar levels in blood; food sources for chromium include egg yolks, raw sugar, cheese, nuts, beets, whole grains, and meat.

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

The United States government periodically publishes recommended diets and consumption levels of the various elements of food. Again, your doctor may encourage deviations from the average official recommendation based on your specific condition. To learn more about basic dietary guidelines, visit the Web site: **http://www.health.gov/dietaryguidelines/**. Based on these guidelines, many foods are required to list the nutrition levels on the food's packaging. Labeling Requirements are listed at the following site maintained by the Food and Drug Administration: **http://www.cfsan.fda.gov/~dms/lab-cons.html**. When interpreting these requirements, the government recommends that consumers become familiar with the following abbreviations before reading FDA literature:[44]

- **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.

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[44] 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?[45]

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."[46] According to the ODS, dietary supplements can have an important impact on the prevention and management of disease and on the maintenance of health.[47] The ODS notes that considerable research on the effects of dietary supplements has been conducted in Asia and Europe where

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

[46] 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**.

[47] 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."

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 Hookworm Infection

The NIH maintains an office dedicated to patient nutrition and diet. The National Institutes of Health's Office of Dietary Supplements (ODS) offers a searchable bibliographic database called the IBIDS (International Bibliographic Information on Dietary Supplements). The IBIDS contains over 460,000 scientific citations and summaries about dietary supplements and nutrition as well as references to published international, scientific literature on dietary supplements such as vitamins, minerals, and botanicals.[48] IBIDS is available to the public free of charge through the ODS Internet page: **http://ods.od.nih.gov/databases/ibids.html**.

After entering the search area, you have three choices: (1) IBIDS Consumer Database, (2) Full IBIDS Database, or (3) Peer Reviewed Citations Only. We recommend that you start with the Consumer Database. While you may not find references for the topics that are of most interest to you, check back

[48] 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.

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 "hookworm infection" (or synonyms) into the search box. To narrow the search, you can also select the "Title" field.

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

- **A hookworm glycoprotein that inhibits neutrophil function is a ligand of the integrin CD11b/CD18.**
  Source: Moyle, M. Foster, D.L. McGrath, D.E. Brown, S.M. Laroche, Y. Meutter, J. de. Stanssens, P. Bogowitz, C.A. Fried, V.A. Ely, J.A. J-biol-chem. Baltimore, Md. : American Society for Biochemistry and Molecular Biology. April 1, 1994. volume 269 (13) page 10008-10015. 0021-9258
- **Albumin and a dialyzable serum factor stimulate feeding in vitro by third-stage larvae of the canine hookworm Ancylostoma caninum.**
  Author(s): Department of Pathobiology, University of Pennsylvania, Philadelphia 19104.
  Source: Hawdon, J M Schad, G A J-Parasitol. 1991 August; 77(4): 587-91 0022-3395
- **Ascariasis, hookworm infection and serum retinol amongst children in Nepal.**
  Author(s): International Course for PHC Managers, Istituto Superiore di Sanita, Ministry of Health, Rome, Italy.
  Source: Curtale, F Vaidya, Y Muhilal Tilden, R L Panminerva-Med. 1994 March; 36(1): 19-21 0031-0808
- **Efficacy of an ivermectin and pyrantel pamoate combination against adult hookworm, Ancylostoma braziliense, in dogs.**
  Author(s): Merck Research Laboratories, Rahway, NJ 07065-0900, USA.
  Source: Shoop, W L Michael, B F Soll, M D Clark, J N Aust-Vet-J. 1996 March; 73(3): 84-5 0005-0423
- **Efficacy of an ivermectin/pyrantel pamoate chewable formulation against the canine hookworms, Uncinaria stenocephala and Ancylostoma caninum.**
  Author(s): Department of Pathobiology, University of Pennsylvania School of Veterinary Medicine, Philadelphia 19104.

Source: Nolan, T J Hawdon, J M Longhofer, S L Daurio, C P Schad, G A Vet-Parasitol. 1992 February; 41(1-2): 121-5 0304-4017

- **Eotaxin is specifically cleaved by hookworm metalloproteases preventing its action in vitro and in vivo.**
  Author(s): Leukocyte Biology Section, Biomedical Sciences Division, Imperial College School of Medicine, South Kensington, London, United Kingdom. f.culley@ic.ac.uk
  Source: Culley, F J Brown, A Conroy, D M Sabroe, I Pritchard, D I Williams, T J J-Immunol. 2000 December 1; 165(11): 6447-53 0022-1767

- **Hemoquant determination of hookworm-related blood loss and its role in iron deficiency in African children.**
  Author(s): Department of International Health, Johns Hopkins University, Baltimore, Maryland, USA.
  Source: Stoltzfus, R J Albonico, M Chwaya, H M Savioli, L Tielsch, J Schulze, K Yip, R Am-J-Trop-Med-Hyg. 1996 October; 55(4): 399-404 0002-9637

- **Hookworm control as a strategy to prevent iron deficiency.**
  Author(s): Center for Human Nutrition, Johns Hopkins School of Hygiene and Public Health, Baltimore, Maryland 21205, USA.
  Source: Stoltzfus, R J Dreyfuss, M L Chwaya, H M Albonico, M Nutr-Revolume 1997 June; 55(6): 223-32 0029-6643

- **Hookworm infection and disease: advances for control.**
  Author(s): Comitato Scientifico, Fondazione Ivo de Carneri, Milan, Italy.
  Source: Albonico, M Savioli, L Ann-Ist-Super-Sanita. 1997; 33(4): 567-79 0021-2571

- **Hookworm infection and protein-energy malnutrition: transverse evidence from two Malaysian ecological groups.**
  Author(s): Institute for Medical Research, Kuala Lumpur, Malaysia.
  Source: Foo, L C Trop-Geogr-Med. 1990 January; 42(1): 8-12 0041-3232

- **Hookworms, malaria and vitamin A deficiency contribute to anemia and iron deficiency among pregnant women in the plains of Nepal.**
  Author(s): Department of International Health, The Johns Hopkins School of Hygiene and Public Health, Baltimore, MD 21205, USA.
  Source: Dreyfuss, M L Stoltzfus, R J Shrestha, J B Pradhan, E K LeClerq, S C Khatry, S K Shrestha, S R Katz, J Albonico, M West, K P Jr J-Nutr. 2000 October; 130(10): 2527-36 0022-3166

- **Human hookworm Necator americanus in the intestines of young adult hamsters.**
  Author(s): Pharma Division, Hindustan Ciba-Geigy Ltd., Bombay, India.
  Source: Rajasekariah, G R Dhage, K R Bose, S Deb, B N J-Parasitol. 1987 December; 73(6): 1252-4 0022-3395

- **Levels of biogenic amines in larvae and adults of the rat hookworm, Nippostrongylus brasiliensis (Nematoda).**
  Author(s): Laboratoire de Biologie et Controle des Organismes Parasites, Faculte de Pharmacie, Universite de Paris-Sud, Chatenay-Malabry, France.
  Source: Goudey Perriere, F Grosclaude, J M Nembo, B Barreteau, H Jacquot, C Gayral, P Comp-Biochem-Physiol-A-Physiol. 1997 November; 118(3): 615-23 1096-4940
- **Structural analysis of the catalytic site of AcCP-1, a cysteine proteinase secreted by the hookworm Ancylostoma caninum.**
  Source: Brinkworth, R.I. Brindley, P.J. Harrop, S.A. Biochim-biophys-acta. Amsterdam : Elsevier Science B.V. November 14, 1996. volume 1298 (1) page 4-8. 0006-3002
- **The contribution of hookworm and other parasitic infections to haemoglobin and iron status among children and adults in western Kenya.**
  Author(s): Danish Bilharziasis Laboratory, Charlottenlund, Denmark. ao@bilharziasis.dk
  Source: Olsen, A Magnussen, P Ouma, J H Andreassen, J Friis, H Trans-R-Soc-Trop-Med-Hyg. 1998 Nov-December; 92(6): 643-9 0035-9203

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:

Acetylcholinesterase: An enzyme that catalyzes the hydrolysis of acetylcholine to choline and acetate. In the CNS, this enzyme plays a role in the function of peripheral neuromuscular junctions. EC 3.1.1.7. [NIH]

Bacteria: Unicellular prokaryotic microorganisms which generally possess rigid cell walls, multiply by cell division, and exhibit three principal forms:

round or coccal, rodlike or bacillary, and spiral or spirochetal. [NIH]

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]

Cysteine: A thiol-containing non-essential amino acid that is oxidized to form cystine. [NIH]

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

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

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]

Nippostrongylus: A genus of intestinal nematode parasites belonging to the superfamily heligmosomatoidea, which commonly occurs in rats but has been experimentally transmitted to other rodents and rabbits. Infection is usually through the skin. [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]

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]

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

APPENDIX D. FINDING MEDICAL LIBRARIES

Overview

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

Preparation

Before going to the library, highlight the references mentioned in this sourcebook that you find interesting. Focus on those items that are not available via the Internet, and ask the reference librarian for help with your search. He or she may know of additional resources that could be helpful to you. Most importantly, your local public library and medical libraries have Interlibrary Loan programs with the National Library of Medicine (NLM), one of the largest medical collections in the world. According to the NLM, most of the literature in the general and historical collections of the National Library of Medicine is available on interlibrary loan to any library. NLM's interlibrary loan services are only available to libraries. If you would like to access NLM medical literature, then visit a library in your area that can request the publications for you.[49]

[49] 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):[50]

- **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/**

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

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

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

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

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

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

APPENDIX E. YOUR RIGHTS AND INSURANCE

Overview

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

Your Rights as a Patient

The President's Advisory Commission on Consumer Protection and Quality in the Healthcare Industry has created the following summary of your rights as a patient.[51]

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.

[51]Adapted 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.[52]

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."[53] 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.

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[52] 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.

[53] 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.[54] The U.S. Department of Labor, in particular, recommends ten ways to make your health benefits choices work best for you.[55]

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.

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

[55] 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.[56]

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.

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[56] 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.[57] NORD

[57] 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:[58]

- 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

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

APPENDIX F. MORE ON PARASITIC ROUNDWORM DISEASES

Overview[59]

A parasite is a living being or organism that exists by depending on another organism. Parasites that infect humans are much more widespread than many people realize. These diseases affect not only poverty-stricken peoples in remote areas of the world, but they also can be important health problems for rich and poor throughout the world, including the United States.

As with other parasitic diseases, roundworm infections are more common in warm climates than in cooler, temperate areas. Many roundworm parasitic diseases result from human carelessness and a lack of appropriate personal hygiene and sanitation measures. Thus, the best solution to the problem rests in preventing these infections rather than in curing them.

Roundworms, or nematodes, are a group of invertebrates (animals having no backbone) with long, round bodies. They range in size from those plainly visible to the naked eye to those several hundredths-of-an-inch long and visible only under a microscope. Most roundworms or their eggs are found in the soil and can be picked up on the hands and transferred to the mouth or can enter through the skin. With the exception of the roundworm that causes trichinosis, mature roundworms eventually end up or live in human intestines and cause a variety of health problems.

Some of the most common parasitic roundworms in humans are:

- Enterobius vermicularis, the pinworm that causes enterobiasis;

[59] Adapted from the National Institute of Allergy and Infectious Diseases (NIAID): **http://www.niaid.nih.gov/factsheets/roundwor.htm**.

- Ascaris lumbricoides, the large intestinal roundworm that causes ascariasis;
- Necator and Ancylostoma, two types of hookworms that cause ancylostomiasis;
- Trichuris trichiura, the whipworm that causes trichuriasis;
- Strongyloides stercoralis that causes strongyloidiasis; and
- Trichinella spiralis that causes trichinosis.

Pinworm Infection (Enterobiasis)

A pinworm is the most common roundworm parasite in temperate climates – even in areas with high levels of sanitation. In the United States, it is the most common of all parasitic roundworm infections, affecting up to one-third of the country's children. Because pinworm infection is spread mainly by children, it is found most often in family groups, day-care centers, schools, and camps.

Pinworms are small, threadlike roundworms found primarily in the colon and rectum. The life cycle of the pinworm – egg, larva, and mature worm – takes place inside the human body and requires from three to six weeks to complete.

How Do Pinworms Get into the Body?

Pinworms enter the body when eggs are swallowed. The female pinworm expels thousands of eggs into the environment. Because the eggs are moist and a bit resistant to drying, they may be able to infect someone for several days after being distributed in dust. They can cling to the fingers of children.

Exposure to infective eggs may occur when the person who is infected scratches the contaminated area (the area around the anus where the female worm deposits her eggs) and then transfers the eggs to the fingertips and from there to the mouth. The eggs may be scattered into the air from bed linen and clothing, and can cling to doorknobs, furniture, tubs and faucets, and even food. Although a person may have no symptoms over a long period, episodes of infection may return repeatedly.

Folklore is filled with fantastic descriptions of symptoms and abnormal behavior blamed on pinworm infection. Actually, the symptoms are usually

mild and vague. Movement of egg-laden female worms from the anus will often produce itching of the anus or vagina that, in some cases, may become very intense and even interfere with sleep.

How Is Pinworm Infection Diagnosed?

A doctor or other health care worker can diagnose pinworm infection by finding the eggs. The most common way to collect the eggs is a rather simple one involving swabbing the anal area with the sticky side of a piece of transparent cellophane tape. The tape is then transferred to a slide where it can be looked at under a microscope.

How Can Pinworm Infections Be Prevented?

You can prevent becoming infected or reinfected with pinworms by:

- Bathing frequently;
- Using clean underclothing, night clothes, and bed sheets; and
- Washing your hands routinely, particularly after using the bathroom.

How Are Pinworm Infections Treated?

Some doctors believe that no treatment is necessary for pinworm infections that have no symptoms. This is because children usually outgrow the infection. Because of the strong probability that small children will get infected again outside the home, strenuous efforts to eliminate the eggs from the household are of little help.

If the doctor does prescribe medicine, all members of the household should take it, regardless of whether they have symptoms. Drugs such as mebendazole and pyrantel pamoate (Povan) are the most useful in treating pinworm infections.

To relieve intense itching that often accompanies pinworm infection, a doctor may prescribe a soothing ointment or cream.

Ascariasis

The name Ascaris lumbricoides reflects the resemblance of this intestinal roundworm to the common earthworm known as Lumbricus. Ranging in length from six to 13 inches, the female worm may grow to be as thick as a pencil. Ascaris infections are common throughout the world in both temperate and tropical areas. In areas of poor sanitation, everyone may be harboring the parasite. Amazingly, up to a hundred worms can infect one person.

How Is Ascariasis Spread?

Almost more than any other parasitic disease, human carelessness causes ascaris. Human feces in streets, fields, and yards are a major source of infective eggs in heavily populated areas. The eggs of ascarids do not infect humans when first excreted by the worm. The eggs are very resistant to extremes of temperature and humidity. They usually are transmitted by hand to mouth, although the use of human feces as fertilizer may also permit transmission of infective eggs by food that is grown in the soil and eaten without being thoroughly washed. The eggs require several weeks to develop and become infective.

When a person swallows the eggs, they pass into the intestine where they hatch into larvae. The larvae then begin their journey through the body. Once through the intestinal wall, they reach the lungs by means of the blood or lymphatic system. In the lungs, they pass through the air sacs, are carried up the bronchial tree, and are re-swallowed to be returned to the small intestine where they grow, mature, and mate. The worms become mature in about two months.

Can Pets Transmit These Worms to Humans?

Other species of ascarids such as Toxocara, which infect dogs and cats, can, under certain circumstances, be picked up by humans. In dogs and cats, these ascarids have a migratory cycle similar to A. lumbricoides. In humans, however, they fail to reach the intestine. Instead they remain active in other body tissue for some time. This state of larval migration is known as visceral larva migrans.

Young puppies and kittens contribute most to contamination of soil by eggs that must incubate for some time in the soil. Almost all dogs are infected at birth. Older dogs, however, have usually become immune to the parasite.

What Are the Symptoms of Ascariasis?

A few worms in the intestine may cause no symptoms or may give rise only to vague or intermittent abdominal pain. Heavy infection may cause partial or complete blockage of the intestine resulting in severe abdominal pain, vomiting, restlessness, and disturbed sleep. The heavier or greater the worm infection, the more severe the symptoms are likely to be. Occasionally, the first sign of infection may be the presence of a worm in vomit or in the stool.

How Is Ascariasis Diagnosed?

A large number of larvae invading the lungs at one time may cause pneumonia. This stage of the disease precedes the intestinal phase by weeks, and the symptoms are difficult to diagnose. Once mature female worms are present in the intestine, however, a doctor can diagnose the infection by finding characteristic eggs in the stool.

How Is Ascariasis Treated?

Doctors can treat ascariasis successfully with mebendazole, albendazole, or pyrantel pamoate.

Hookworm Disease (Ancylostomiasis)

One of the most common roundworm infections is hookworm. Like ascarids, people pick up hookworms as a result of unsanitary conditions. Hookworm eggs are passed in human feces onto the ground where they develop into infective larvae. When the soil is cool, the worms crawl to the nearest moist area and extend their bodies into the air. They remain there – waving their bodies to and fro – until they come into contact with the skin, usually on a bare foot, or until they are driven back down by the heat.

Hookworm is widespread in those tropical and subtropical countries in which people defecate on the ground and soil moisture is most favorable.

Necator americanus is the prevailing species in the southeastern United States.

How Is Hookworm Disease Spread?

People usually get this infection by walking barefoot over contaminated soil. In penetrating the skin, the larvae may cause an allergic reaction. It is from the itchy patch at the place where the larvae entered that the early infection gets its nickname "ground itch." Once larvae have broken through the skin, they enter the bloodstream and are carried to the lungs. (Unlike ascarids, however, hookworms do not usually cause pneumonia.) The larvae migrate from the lungs up the windpipe to be swallowed and carried back down to the intestine.

What Are the Symptoms of Hookworm Disease?

Diarrhea, particularly in person who has never been infected, sometimes starts as the worms mature in the intestines and before eggs appear in the stool. Other signs and symptoms at this stage include vague abdominal pain, intestinal cramps, colic, and nausea.

Scientists have learned that people in good health and on a diet containing adequate iron can tolerate the presence of these worms in small or moderate numbers without having problems. In chronic infections, if the number of parasites becomes great enough, a person can develop serious anemia because of blood loss from the worms attaching themselves to the intestine and sucking the blood and tissue juices.

If humans come into contact with larvae of the dog hookworm or the cat hookworm, or larvae of certain other hookworms that do not infect humans, the larvae may penetrate the skin. But these larvae cannot complete their migratory cycle in humans. Instead, they move just below the skin producing snake-like markings and intense itching. This is referred to as a creeping eruption or cutaneous larva migrans.

Ancylostoma canium, an illness caused by a particular species of dog hookworm, has been described in Australia. This worm may almost complete its development in the lower small intestine, but produces a severe inflammatory reaction in the bowel, causing abdominal pain, diarrhea, and an increase in certain white blood cells called eosinophils.

How Is Hookworm Disease Diagnosed?

A laboratory worker will examine stool specimens to look for and count the number of eggs. If the egg output is large enough – more than 2,000 eggs per gram of stool – the doctor will assume that the infection may cause anemia and start treating the patient.

How Is Hookworm Disease Treated?

Once a person has been diagnosed with hookworm disease, a doctor can prescribe medicines such as mebendazole or albendazole. Frequently, the doctor will add an iron supplement to this treatment.

Whipworm Disease (Trichuriasis)

This parasitic roundworm infection of the large intestine often has no symptoms, but a doctor usually can diagnose it by examining the stool and finding whipworm eggs. Heavy infections may cause intermittent stomach pain, bloody stools, diarrhea, and weight loss. The name whipworm comes from the parasite's long, very thin, whiplike shape. Fertilized eggs develop outside the body, and an embryonated egg is produced in three weeks in a favorable environment; that is, warm, moist, shaded soil.

Although the incidence of whipworm infection is high, its intensity is usually light. In the United States, the infection occurs principally in warm, moist climates, most frequently among children. People can get infected by accidentally eating whipworm eggs on their hands or in food or drink. Severe infections in young children can result in serious disease with bloody diarrhea and a condition called rectal prolapse.

Doctors treat whipworm disease most often with mebendazole and albendazole.

Strongyloidiasis

The parasitic roundworm called Strongyloides stercoralis mainly infects humans. This parasite has different types of life cycles. One is direct, similar to that of the hookworm. After a short feeding period and development in the soil, the larvae penetrate human skin, enter the blood stream, and pass

through the right side of the heart to the lungs. From the lungs, the adolescent parasites go up the windpipe into the mouth, are swallowed, and reach the upper part of the small intestine where they develop into mature worms.

Under certain conditions, parasites may undergo an indirect life cycle in which free-living mature male and female worms develop in the soil and produce a new generation of large numbers of larvae.

At times, the larvae may develop rapidly into the infective state in the intestine where they penetrate the intestinal lining instead of passing out of the body in the feces, as occurs normally. This modification of the life cycle, called internal autoinfection, explains persistent strongyloidiasis, as long as 40 years in patients who have moved to areas where the disease is not generally found. Autoinfection may produce heavy infections and severe disease, especially in patients with reduced immunity such as those receiving corticosteroids or other immunosuppressive drug treatment.

What Are the Symptoms of Strongyloidiasis?

Many Strongyloides infections are mild and go unnoticed. Moderate infections may cause a burning pain in the abdomen. Nausea and vomiting may be present, and diarrhea and constipation alternate. Severe infections result in anemia, weight loss, and chronic diarrhea.

How Is Strongyloidiasis Diagnosed?

Laboratory diagnosis includes the examination of feces and duodenal contents for larvae. Scientists at the National Institute of Allergy and Infectious Diseases have developed a reliable blood test to detect antibodies to Strongyloides.

How Is Strongyloidiasis Treated?

Thiabendazole (Mintezol) given twice daily for two or three days is the one of the treatments doctors recommend. Ivermectin given in one or two days, or albendazole given in two courses 10 days apart also are effective.

Trichinosis

Trichinosis is an infection by the larvae of a most versatile roundworm, Trichinella spiralis. This parasite can infect virtually every meat-eating mammal. Unlike the other parasitic roundworm diseases that have been discussed, trichinosis is not an intestinal infection in the usual sense. It is the migration of T. spiralis larvae through the body and their encystment (becoming enclosed in a capsule) in a muscle that creates serious problems. The parasite is especially common in rats and in swine that feed on uncooked garbage. The disease occurs in humans when they eat undercooked infected pork.

Although trichinosis is sometimes found in cities, it is much more common in rural areas, particularly in the hog-raising areas of the United States. Because many states have adopted laws requiring that all garbage fed to hogs be sterilized, fewer people get trichinosis.

Typically, the life cycle of the parasite begins when a person or an animal eats contaminated meat containing larvae. Digestive juices from the stomach dissolve the capsule-like cyst and release the parasites. The larvae then penetrate into the intestine where they mature and mate. Female worms then pass larvae into the blood stream where they make their way through the capillaries (tiny blood vessels) into the muscle fibers. Once in the muscle fibers, they encyst again and begin a sometimes long life.

What Are the Symptoms of Trichinosis?

The average case of trichinosis is not severe and produces no noticeable discomfort. It can produce symptoms that are frequently overlooked or ignored – a slight stomachache and achy muscles and joints. Invasion by a large number of parasites, however, produces symptoms that mimic food poisoning followed by severe "muscular rheumatism."

How Is Trichinosis Diagnosed?

Although a doctor may suspect that a patient has trichinosis on the basis of clinical signs, it is usually diagnosed as the result of: 1) a blood test that shows an increase in the number of eosinophils, a type of white blood cell; or 2) microscopic examination of muscle tissue to look for the larvae.

How Is Trichinosis Treated?

A doctor can prescribe medicine only to relieve symptoms. There is no treatment for the infection. If the doctor diagnoses infection while the patient is still having digestive symptoms, standard antiparasite drugs can be used to dislodge some of the worms. Once encystment of the parasite has begun, treatment is for any symptoms. In most cases, the chances of recovery are good.

Thiabendazole may help patients with trichinosis if treatment is begun very early, during the incubation state. Corticosteroids can relieve the inflammatory reaction during the larval migration state, and the patient should take them with thiabenazole. Steroids could, however, prolong the intestinal phase of the infection.

How Is Trichinosis Prevented?

Researchers and health care providers have known all the basic facts necessary for preventing trichinosis in humans for years. You can kill the parasite by cooking (allowing all parts of the meat to reach at least 150 degrees Fahrenheit), freezing (16 degrees Fahrenheit for 36 hours). Irradiation can also kill T. spiralis. Smoking, pickling, and other methods of processing or preserving meats do not kill the parasite.

Research

Researchers at the National Institute of Allergy and Infectious (NIAID) diseases are conducting basic and clinical research on the prevention, control, and treatment of a variety of parasitic diseases, including some caused by parasitic roundworms. NIAID scientists are trying to determine the factors that allow Strongyloides stercoralis roundworms to infect humans and cause disease. The findings from this research may help scientists develop a skin test to diagnose stronglyloidiasis.

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 hookworm infection and keep them on file. The NIH, in particular, suggests that patients with hookworm infection visit the following Web sites in the ADAM Medical Encyclopedia:

- **Basic Guidelines for Hookworm**

  Hookworm
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/000629.htm

- **Signs & Symptoms for Hookworm**

  Anemia
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/000560.htm

  Blood in the stool
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003130.htm

  Bloody sputum
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003073.htm

  Cough
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003072.htm

  Coughing
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003072.htm

  Diarrhea
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003126.htm

  Dyspnea
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003075.htm

  Edema
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003103.htm

Fatigue
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003088.htm

Fever
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003090.htm

Itch
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003217.htm

Itchy
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003217.htm

Loss of appetite
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003121.htm

Pallor
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003244.htm

Rash
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003220.htm

Skin rash
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003220.htm

Tachycardia
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003077.htm

Vomiting
Web site:
http://www.nlm.nih.gov/medlineplus/ency/article/003117.htm

- **Diagnostics and Tests for Hookworm**

  ALT
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003473.htm

  D-xylose absorption
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003606.htm

  Stool ova and parasites exam
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003756.htm

  X-ray
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/003337.htm

- **Nutrition for Hookworm**

  Protein
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/002467.htm

  Protein in diet
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/002467.htm

- **Background Topics for Hookworm**

  Abdominal discomfort
  Web site:
  http://www.nlm.nih.gov/medlineplus/ency/article/002228.htm

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**

HOOKWORM INFECTION GLOSSARY

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

Abdomen: That portion of the body that lies between the thorax and the pelvis. [NIH]

Acetylcholinesterase: An enzyme that catalyzes the hydrolysis of acetylcholine to choline and acetate. In the CNS, this enzyme plays a role in the function of peripheral neuromuscular junctions. EC 3.1.1.7. [NIH]

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]

Anaemia: A reduction below normal in the number of erythrocytes per cu. mm., in the quantity of haemoglobin, or in the volume of packed red cells per 100 ml. of blood which occurs when the equilibrium between blood loss (through bleeding or destruction) and blood production is disturbed. [EU]

Ancylostoma: A genus of nematode intestinal parasites that consists of several species. A. duodenale is the common hookworm in humans. A. braziliense, A. ceylonicum, and A. caninum occur primarily in cats and dogs, but all have been known to occur in humans. [NIH]

Ancylostomiasis: Infection of humans or animals with hookworms of the genus ancylostoma. Characteristics include anemia, dyspepsia, eosinophilia, and abdominal swelling. [NIH]

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

Anthelmintics: Agents destructive to parasitic worms. They are used therapeutically in the treatment of helminthiasis in man and animal. [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]

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 ode of action as agglutinins, bacteriolysins, haemolysins, opsonins, precipitins, etc. [EU]

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

Ascariasis: Infection by nematodes of the genus ascaris. Ingestion of infective eggs causes diarrhea and pneumonitis. Its distribution is more prevalent in areas of poor sanitation and where human feces are used for fertilizer. [NIH]

Ascaris: A genus of nematodes of the superfamily ascaridoidea whose species usually inhabit the intestine. [NIH]

Aspiration: The act of inhaling. [EU]

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

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

Berberine: An alkaloid from Hydrastis canadensis L., Berberidaceae. It is also found in many other plants. It is relatively toxic parenterally, but has been used orally for various parasitic and fungal infections and as antidiarrheal. [NIH]

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

Bronchial: Pertaining to one or more bronchi. [EU]

Capillaria: A genus of trichuroid nematodes parasitic in the liver and intestines of many mammals and birds. Two species, C. hepatica and C. philippinensis, produce often fatal infections in man. [NIH]

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]

Cardiac: Pertaining to the heart. [EU]

Causal: Pertaining to a cause; directed against a cause. [EU]

Chemotherapy: The treatment of disease by means of chemicals that have a specific toxic effect upon the disease - producing microorganisms or that

selectively destroy cancerous tissue. [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]

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

Coagulation: 1. the process of clot formation. 2. in colloid chemistry, the solidification of a sol into a gelatinous mass; an alteration of a disperse phase or of a dissolved solid which causes the separation of the system into a liquid phase and an insoluble mass called the clot or curd. Coagulation is usually irreversible. 3. in surgery, the disruption of tissue by physical means to form an amorphous residuum, as in electrocoagulation and photocoagulation. [EU]

Coccidiosis: Protozoan infection found in animals and man. It is caused by several different genera of COCCIDIA. [NIH]

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

Collagen: The protein substance of the white fibres (collagenous fibres) of skin, tendon, bone, cartilage, and all other connective tissue; composed of molecules of tropocollagen (q.v.), it is converted into gelatin by boiling. collagenous pertaining to collagen; forming or producing collagen. [EU]

Constipation: Infrequent or difficult evacuation of the faeces. [EU]

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

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

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

Cyst: Any closed cavity or sac; normal or abnormal, lined by epithelium, and especially one that contains a liquid or semisolid material. [EU]

Cysteine: A thiol-containing non-essential amino acid that is oxidized to form CYSTINE. [NIH]

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

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

Duodenum: The first or proximal portion of the small intestine, extending from the pylorus to the jejunum; so called because it is about 12 fingerbreadths in length. [EU]

Dyspnea: Difficult or labored breathing. [NIH]

Edema: Excessive amount of watery fluid accumulated in the intercellular

spaces, most commonly present in subcutaneous tissue. [NIH]

Enterobiasis: Infection with nematodes of the genus enterobius. E. vermicularis, the pinworm of man, causes a crawling sensation and pruritus. This condition results in scratching the area, occasionally causing scarification. [NIH]

Enterobius: A genus of intestinal nematode worms which includes the pinworm or threadworm Enterobius vermicularis. [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]

Eosinophils: Granular leukocytes with a nucleus that usually has two lobes connected by a slender thread of chromatin, and cytoplasm containing coarse, round granules that are uniform in size and stainable by eosin. [NIH]

Epidermal: Pertaining to or resembling epidermis. Called also epidermic or epidermoid. [EU]

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

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

Filariasis: Infections with nematodes of the superfamily filarioidea. The presence of living worms in the body is mainly asymptomatic but the death of adult worms leads to granulomatous inflammation and permanent fibrosis. Organisms of the genus Elaeophora infect wild elk and domestic sheep causing ischaemic necrosis of the brain, blindness, and dermatosis of the face. [NIH]

Folklore: The common orally transmitted traditions, myths, festivals, songs, superstitions, and stories of all peoples. [NIH]

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

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

Glycine: A non-essential amino acid. It is found primarily in gelatin and silk fibroin and used therapeutically as a nutrient. It is also a fast inhibitory

neurotransmitter. [NIH]

Helminths: Commonly known as parasitic worms, this group includes the acanthocephala, nematoda, and platyhelminths. Some authors consider certain species of leeches that can become temporarily parasitic as helminths. [NIH]

Hemorrhage: Bleeding or escape of blood from a vessel. [NIH]

Hypersensitivity: A state of altered reactivity in which the body reacts with an exaggerated immune response to a foreign substance. Hypersensitivity reactions are classified as immediate or delayed, types I and IV, respectively, in the Gell and Coombs classification (q.v.) of immune responses. [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]

Immunization: The induction of immunity. [EU]

Incubation: The development of an infectious disease from the entrance of the pathogen to the appearance of clinical symptoms. [EU]

Intermittent: Occurring at separated intervals; having periods of cessation of activity. [EU]

Intestinal: Pertaining to the intestine. [EU]

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

Intramuscular: Within the substance of a muscle. [EU]

Invertebrates: Animals that have no spinal column. [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]

Isosporiasis: Infection with parasitic protozoa of the genus isospora, producing intestinal disease. It is caused by ingestion of oocysts and can produce tissue cysts. [NIH]

Lumen: The cavity or channel within a tube or tubular organ. [EU]

Mebendazole: A nematocide in humans and animals. It acts by interfering with the carbohydrate metabolism and associated energy production of the parasite. [NIH]

Mental: Pertaining to the mind; psychic. 2. (L. mentum chin) pertaining to the chin. [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]

Mucosa: A mucous membrane, or tunica mucosa. [EU]

Mutagenesis: Process of generating genetic mutations. It may occur spontaneously or be induced by mutagens. [NIH]

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

Necator: A genus of intestinal parasite worms which includes one of the most important hookworms of man, necator americanus. The only other known species, N. suillus, has been recovered from pigs. [NIH]

Nematoda: A class of unsegmented helminths with fundamental bilateral symmetry and secondary triradiate symmetry of the oral and esophageal structures. Many species are parasites. [NIH]

Neonatal: Pertaining to the first four weeks after birth. [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]

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]

Nippostrongylus: A genus of intestinal nematode parasites belonging to the superfamily heligmosomatoidea, which commonly occurs in rats but has been experimentally transmitted to other rodents and rabbits. Infection is usually through the skin. [NIH]

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

Osmotic: Pertaining to or of the nature of osmosis (= the passage of pure solvent from a solution of lesser to one of greater solute concentration when the two solutions are separated by a membrane which selectively prevents the passage of solute molecules, but is permeable to the solvent). [EU]

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

Pallor: A clinical manifestation consisting of an unnatural paleness of the skin. [NIH]

Paragonimus: A genus of lung flukes of the family Troglotrematidae. This genus consists of several species one of which is P. westermani, a common lung fluke in man. Members of this and other species also occur in other mammals. [NIH]

Parasitic: Pertaining to, of the nature of, or caused by a parasite. [EU]

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

Phenotype: The outward appearance of the individual. It is the product of interactions between genes and between the genotype and the environment. This includes the killer phenotype, characteristic of yeasts. [NIH]

Phosphorylation: The introduction of a phosphoryl group into a compound through the formation of an ester bond between the compound and a phosphorus moiety. [NIH]

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

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

Polypeptide: A peptide which on hydrolysis yields more than two amino acids; called tripeptides, tetrapeptides, etc. according to the number of amino acids contained. [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]

Prevalence: The total number of cases of a given disease in a specified population at a designated time. It is differentiated from incidence, which refers to the number of new cases in the population at a given time. [NIH]

Prolapse: 1. the falling down, or sinking, of a part or viscus; procidentia. 2. to undergo such displacement. [EU]

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

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

Protozoan: 1. any individual of the protozoa; protozoon. 2. of or pertaining to the protozoa; protozoal. [EU]

Psychology: The science dealing with the study of mental processes and behavior in man and animals. [NIH]

Pulmonary: Pertaining to the lungs. [EU]

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

Rectal: Pertaining to the rectum (= distal portion of the large intestine). [EU]

Reinfection: A second infection by the same pathogenic agent, or a second infection of an organ such as the kidney by a different pathogenic agent. [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]

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

Schistosoma: A genus of trematode flukes belonging to the family Schistosomatidae. There are over a dozen species. These parasites are found in man and other mammals. Snails are the intermediate hosts. [NIH]

Sedimentation: The act of causing the deposit of sediment, especially by the use of a centrifugal machine. [EU]

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

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]

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

Strongyloides: A genus of parasitic nematodes widely distributed as intestinal parasites of mammals. [NIH]

Strongyloidiasis: Infection with nematodes of the genus strongyloides. The presence of larvae may produce pneumonitis and the presence of adult worms in the intestine could lead to moderate to severe diarrhea. [NIH]

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

Tachycardia: Excessive rapidity in the action of the heart; the term is usually applied to a heart rate above 100 per minute and may be qualified as atrial, junctional (nodal), or ventricular, and as paroxysmal. [EU]

Thermoregulation: Heat regulation. [EU]

Thrombosis: The formation, development, or presence of a thrombus. [EU]

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

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

Toxocara: A genus of ascarid nematodes commonly parasitic in the intestines of cats and dogs. [NIH]

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

Trichinella: A genus of parasitic nematodes that causes trichinosis in man and carnivores. [NIH]

Trichinosis: A disease due to infection with trichinella spiralis. It is caused by eating undercooked meat, usually pork. [NIH]

Trichuriasis: Infection with nematodes of the genus trichuris, formerly called Trichocephalus. [NIH]

Trichuris: A genus of nematode worms comprising the whipworms. [NIH]

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

Tubulin: A microtubule subunit protein found in large quantities in mammalian brain. It has also been isolated from sperm flagella, cilia, and other sources. Structurally, the protein is a dimer with a molecular weight of approximately 120,000 and a sedimentation coefficient of 5.8S. It binds to colchicine, vincristine, and vinblastine. [NIH]

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

Veins: The vessels carrying blood toward the heart. [NIH]

General Dictionaries and Glossaries

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

- **Dictionary of Medical Acronymns & Abbreviations** by Stanley Jablonski (Editor), Paperback, 4th edition (2001), Lippincott Williams & Wilkins Publishers, ISBN: 1560534605, **http://www.amazon.com/exec/obidos/ASIN/1560534605/icongroupinterna**
- **Dictionary of Medical Terms : For the Nonmedical Person (Dictionary of Medical Terms for the Nonmedical Person, Ed 4)** by Mikel A. Rothenberg, M.D, et al, Paperback - 544 pages, 4th edition (2000), Barrons Educational Series, ISBN: 0764112015, **http://www.amazon.com/exec/obidos/ASIN/0764112015/icongroupinterna**
- **A Dictionary of the History of Medicine** by A. Sebastian, CD-Rom edition (2001), CRC Press-Parthenon Publishers, ISBN: 185070368X, **http://www.amazon.com/exec/obidos/ASIN/185070368X/icongroupinterna**
- **Dorland's Illustrated Medical Dictionary (Standard Version)** by Dorland, et al, Hardcover - 2088 pages, 29th edition (2000), W B Saunders Co, ISBN: 0721662544, **http://www.amazon.com/exec/obidos/ASIN/0721662544/icongroupinterna**
- **Dorland's Electronic Medical Dictionary** by Dorland, et al, Software, 29th Book & CD-Rom edition (2000), Harcourt Health Sciences, ISBN: 0721694934, **http://www.amazon.com/exec/obidos/ASIN/0721694934/icongroupinterna**
- **Dorland's Pocket Medical Dictionary (Dorland's Pocket Medical Dictionary, 26th Ed)** Hardcover - 912 pages, 26th edition (2001), W B Saunders Co, ISBN: 0721682812, **http://www.amazon.com/exec/obidos/ASIN/0721682812/icongroupinterna/103-4193558-7304618**
- **Melloni's Illustrated Medical Dictionary (Melloni's Illustrated Medical Dictionary, 4th Ed)** by Melloni, Hardcover, 4th edition (2001), CRC Press-Parthenon Publishers, ISBN: 85070094X, **http://www.amazon.com/exec/obidos/ASIN/85070094X/icongroupinterna**
- **Stedman's Electronic Medical Dictionary Version 5.0 (CD-ROM for Windows and Macintosh, Individual)** by Stedmans, CD-ROM edition (2000), Lippincott Williams & Wilkins Publishers, ISBN: 0781726328, **http://www.amazon.com/exec/obidos/ASIN/0781726328/icongroupinterna**

- **Stedman's Medical Dictionary** by Thomas Lathrop Stedman, Hardcover - 2098 pages, 27th edition (2000), Lippincott, Williams & Wilkins, ISBN: 068340007X, **http://www.amazon.com/exec/obidos/ASIN/068340007X/icongroupinterna**
- **Tabers Cyclopedic Medical Dictionary (Thumb Index)** by Donald Venes (Editor), et al, Hardcover - 2439 pages, 19th edition (2001), F A Davis Co, ISBN: 0803606540, **http://www.amazon.com/exec/obidos/ASIN/0803606540/icongroupinterna**

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