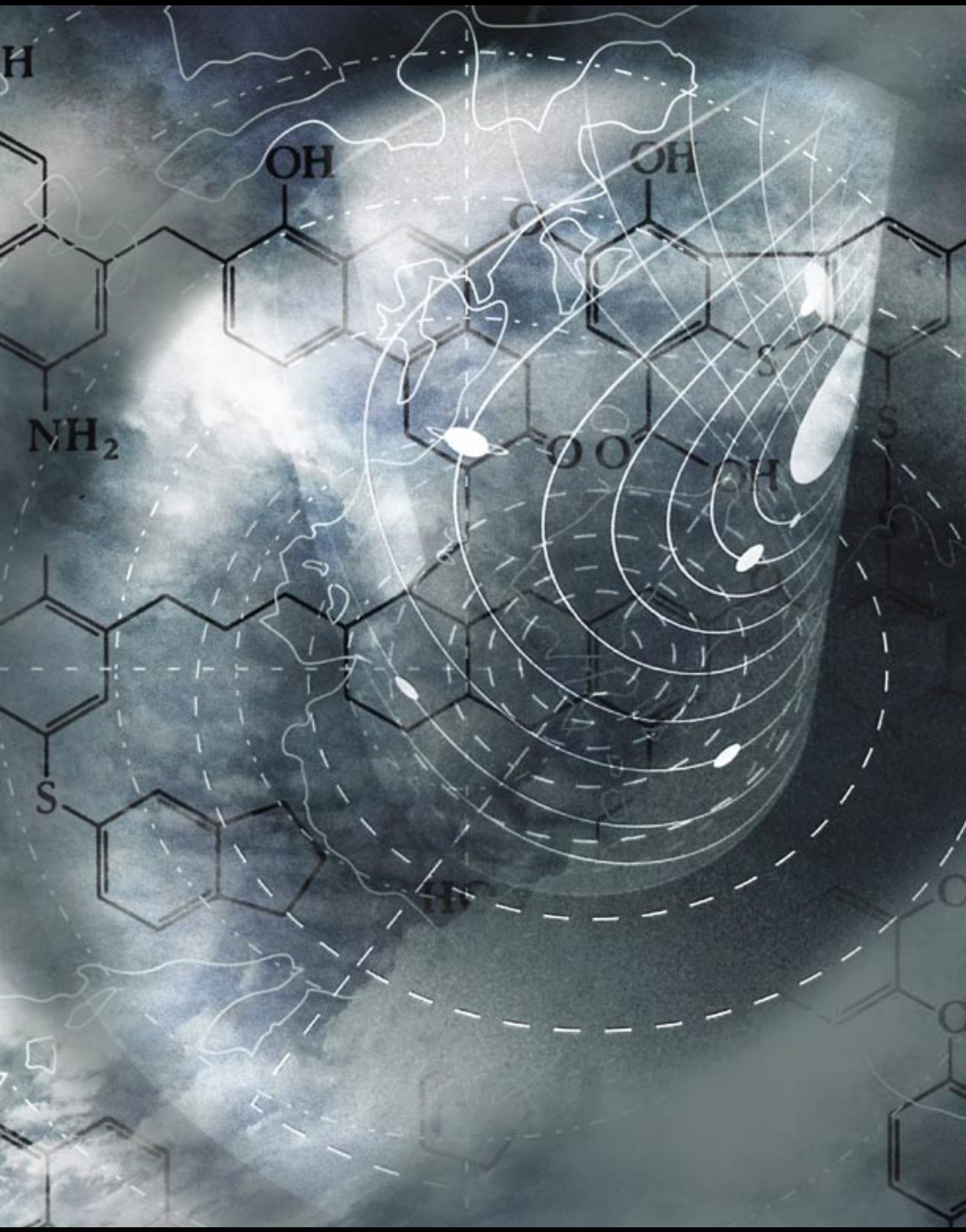
THE JOURNAL OF COLLEGIUM AESCULAPIUM



SUMMER 2002

A PERSONAL NOTE FROM THE EDITOR

Health challenges across the globe, plus the value of service

The opportunity to become the interim editor of this Journal is greatly appreciated. My thanks to Dr. Bruce Woolley and Dr. Glen Griffin for this favorable circumstance. It is assumed that Glen will resume his duties as editor when he returns from his mission.

The *Journal of the Collegium Aesculapium* has a notable past record of achievements. It has been awarded a certificate of excellence from the Academy of Artists not once, but three times. It has profound merit inasmuch as it combines medicine with a spirituality approach that is not found in any other journal in the world. The copies are expensive to produce, but have proved to be exceptional in value to LDS physicians.

This edition of the *Journal* has been devoted to some outstanding health problems concerning the Missionary Program. During the past year, the Public Health Subcommittee has grappled with serious health problems. This *Journal* presents some of these health issues, with the reports written primarily by members of the subcommittees of the Missionary Health Advisory Committee. Dr. Allan Barker and his wife JoAnne were in the Philippines and did an outstanding work there. They were instrumental in turning the problem around and formulating policy. The tuberculosis policy is evolving, and the prime mover is Dr. DuWayne Schmidt, who writes on the subject. Dr. Robert Maddock's review of the medical literature on HIV and AIDS has been very carefully compiled and his hard work is greatly appreciated. Two late additions have pushed our publication back somewhat, but were certainly worth the wait. Elder Alexander B. Morrison's wonderful presentation on service to the Collegium in Salt Lake City this spring elicited such an enthusiastic response that it had been included. In addition, Dr. Bruce Woolley's text regarding the popular South American drink Yerba Mate was also of such interest it had to be added.

A bouquet should be given to Dr. Woolley for the countless hours of work he has expended in the *Journal*'s behalf. He has been a source of strength during years of hardship and struggle.

H. Kent Staheli, M.D.,M.P.H., Editor

About Collegium Aesculapium

In a troubled world, many LDS physicians and health care professionals have an ability to see the whole person in terms of the emotional and spiritual as well as the physical. They desire to put the teachings of the gospel into their daily lives. As they receive knowledge and gain wisdom, they can then offer understanding and give service in order to uplift and sustain the lives of their loved ones and patients.

Collegium Aesculapium addresses the spiritual as well as the physical sides of medicine. Here, thoughts transcending science challenge our exacting professions.

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Collegium Aesculapium encourages physicians, podiatrists, and doctors of pharmacy to become active members of the organization ($125 per year). Special rates are available for retired health professionals ($75) and professionals in their first two years of practice ($50). Nurses, physical therapists, pharmacists and others interested in the Foundation are invited to join as Associate Members ($75 per year). Medical students in training and upper-class premedical students ($35 per year) may also join the Collegium.

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THE JOURNAL OF
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Manuscripts considered for publication in the *Journal of Collegium Aesculapium* must be clinically appropriate and spiritually consistant with the the principles and doctrines of The Church of Jesus Christ of Latter-day Saints. All manuscripts must be clearly written and submitted in a double-spaced 12-point, Times New Roman, Garamond, or Bookman font in a Microsoft Word or WordPerfect e-mail attachment. A manuscript that meets these standards is peer reviewed by several members of the editorial board and is evaluated with the reviews by the editorial staff. After suggested content adjustments are made, an article may be accepted, edited to our standards of style and readable writing, and published in the *Journal*.

Manuscript submissions should be emailed to:
bruce@collegiumaesculapium.org

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THE JOURNAL
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AESCULAPIUM

SUMMER 2002

Service

The Celestial Calling

by

Elder Alexander B. Morrison

We are blessed to live in interesting times — an era of history marked not only by an unprecedented ability to, literally, destroy the human race, but also by truly incredible advances in every aspect of scientific knowledge, including medicine. It seems almost paradoxical that in the midst of so many well-nigh miraculous advances in medicine, when we in America are healthier than ever, many people in this and other Western countries are at the same time more anxious about their health. As noted by Dr. Roy Porter, distinguished professor of the social history of medicine at the Wellcome Institute, "few people today feel confident, either about their personal health or about doctors, health-care delivery and the medical profession in general. The media bombard us with medical news — break-throughs in biotechnology and reproductive technology for instance. But the effect is to raise alarm more than our spirits. We turn doctors into heroes, yet feel equivocal about them."[1]

Since time immemorial mankind has attempted to explain the relationships between health and disease. Most traditional societies have considered birth and death, sickness and health, primarily in the context of an understanding of the relationship of human beings to the wider cosmos: planets, stars, ancestors, gods and demons, sorcery, malevolent spirits, and so on. Since the days of the Greeks and Romans, Western medicine has struggled to replace such supernatural causes of disease by positing a natural basis, governed by natural law.

The beginnings of scientific medicine, which emerged from the Renaissance universities of 14th Century Europe and were given full vigor by the scientific revolution, slowly but surely led the profession to a more firm scientific base. Yet it must be admitted that with a few exceptions — digitalis, opium and Peruvian bark (quinine) come readily to mind — the pharmacological revolution which transformed medicine from a profession with more than its share of quacks and humbugs to what it is today began only a few decades ago, with the introduction of sulfa drugs and antibiotics. Similarly, surgical success was limited at best prior to the introduction of anesthesia and antiseptic techniques in the operating room in the mid-nineteenth century. It must be noted that the ebbing away in Western countries of the great infectious diseases such as diphtheria, typhoid and tuberculosis resulted more from urban improvements such as better housing and sewage removal; enhanced nutrition; and the provision of clean water, than from curative medicine. Even the early striking example of the conquest of disease — Jenner's introduction of vaccination against smallpox — rested more on popular medical folklore than on science. So, too, did John Snow's blunting of a cholera epidemic by removal of the handle of the Broad Street pump in Victorian London. Lewis Thomas has noted that when he entered Harvard Medical School in 1933, the medicine he was trained to practice had not advanced materially since Osler's time. Granted, emerging knowledge of the scientific basis for disease was beginning to transform our understanding of causation, but the treatment of disease was the most minor part of the medical curriculum only seven decades ago. Major emphasis in those days was placed on the recognition of disease entities, their signs and symptoms, and how to make an accurate diagnosis.[2]

Despite the grandeur of the ethos and the edifice of medicine today, with its miraculous cures and interventions not even dreamed of a few years ago, the conquest of disease remains, in some ways at least, as elusive as ever.

The patterns of disease have shifted in Western countries from infectious to chronic disorders, though we are witnessing a recurrence of infectious diseases, in the wake of the growing resistance of microorganisms to antibiotics. In the developing world, the health of hundreds of millions is, if anything, deteriorating in scores of countries which remain economically impoverished and politically mismanaged. However, the basic task of the doctor — to serve and to save — remains unchanged. No task is more noble, no work more challenging. As President David O. McKay said, "the most worthy calling in life is that in which man can serve best his fellow man."[3]

In all of your laudable, and never-ending pursuit of understanding of the science of medicine, it would be so seductively easy to consider man purely in scientific terms, as an extremely complex machine, fully explainable in terms of systems, tissues, cells, biochemical reactions, DNA. Yet, those who do so suffer from a soul-destroying myopia which fails to see the whole man as more than the sum of his parts, both big and small. The English poet, Samuel Coleridge, dismissed doctors as "shallow animals, [who] having always employed their minds about body and gut, ...imagine that in the whole system of things there is nothing but gut and body."[4] With all your learning keep ever in mind that man is a dual creature, composed of spirit and body (see D & C 88:15). Do not become so involved with the body and the science that you neglect the spirit of those whom you are blessed to have as patients. Comforting and caring may be even more important than curing. In this regard, I am pleased to note that increasingly physicians are coming to realize religiously committed people tend to report greater subjective well-being and life satisfaction, experience less anxiety and depression, adjust better to crises and problems, have higher levels of marital satisfaction, are better able to cope with illness, and are less likely to abuse alcohol or drugs. Religion, so long dismissed by the medical establishment as not only irrelevant to physical and mental health, but actually facilitative of mental illness and antithetical to health — "the universal compulsive neurosis of humanity" in Freud's words — is increasingly being seen as an integral part of wellness and an ally of the caring physician.

You must, then, combine a life-long striving for excellence in every technical aspect of your noble profession with a spiritual outlook which sees every patient as a brother or sister, a child of the Eternal Father, endowed by Him with the spirit of divinity. As C. S. Lewis said, with his usual wisdom and insight, "you have never talked to a mere mortal. Nations, cultures, arts, civilization — these are mortal, and their life is to ours as the life of a gnat. But it is immortals whom we joke with, work with, marry, snub and exploit..."[5] That understanding leads you away from the natural man who, with his carnality and selfishness, is an enemy to God, and sets your feet firmly on the disciple's path of service and love.

I continue to be awe-struck by the spiritual implications of Paul's words to the Athenians that God "hath made of one blood all nations of men for to dwell on all the face of the earth..." (Acts 17:26). Comprehension of that statement can transform our understanding of who we are, and of who God is.

We live in a society saturated with self-absorption, a society which promotes and rewards excessive materialism, mocks and erodes moral principles and worships secularism. Increasingly, Western society is bereft of the enduring virtue of honor, of which Pericles, the great Athenian statesman said two and a half millennia ago:

"For the love of honor is ever young, and not riches, as some say, but honor is the delight of men when they are old and useless."[6]

Faced with the wintry reality of life, with all its contradictions and imperfections, its cruelty and injustice, one can feel some sympathy for those who, in their despair, proclaim that the human experience is but a hollow charade, an obscene joke; or in the words of Shakespeare's Macbeth "a walking shadow, a poor player, that struts and frets his hour upon the stage, and then is heard no more... a tale told by an idiot, full of sound and fury, signifying nothing."[7]

Thanks to the glorious Restored Gospel, we know better. Man is "that he might have joy," the scriptures tell us (2 Nephi 2:25). Our task is to fulfill the measure of that destiny by tasting of the sweetness of the joy the Lord wishes for us. As we do so, the scales of cynicism, pride, indifference and disregard for others fall away from our eyes, and we begin to see what God expects us to do with our lives. We see in life's challenges opportunities to serve others. Indeed, every step on the disciple's path leads us onward to service. In fact, if we wish to partake fully of the power of Christ's Atonement, we must serve others. Recall these words of King Benjamin: "for the sake of retaining a remission of your sins from day to day, that ye may walk guiltless before God — I would that ye should impart of your substance to the poor, every man according to that which he hath, such as feeding the hungry, clothing the naked, visiting the sick and administering to their relief, both spiritually and temporally, according to their wants" (Mos. 4:26).

If we are to serve God and our fellow-man effectively — and both aspects of service are essential, as Jesus noted (see Matt. 22:37-39) — we must give away all our sins to know Him as the father of King Lamoni proclaimed to Aaron (see Alma 22:18). We do so by sacred covenant, as we pledge our time, talents and resources to His service. Only then can we have inner peace, even in the midst of trials, temptations and turbulence. As we consecrate our lives to God, we find greater love for spouse and children, greater love for patients and others in our care, and greater knowledge and skill as a physician. Note this: you will be a better person, and a better doctor, as you immunize yourself through consecration against unrighteous pride, anger and intellectual arrogance. To do so is the quest of a lifetime, a task for the eternities.

In no other profession is there a greater opportunity to serve others than in medicine. Daily you battle against sickness, suffering and death. You know that the components of the body are temporal, but the spirit is ageless and eternal. You learn to take an eternal view of man, understanding as you do that eventually all of your patients will die, as you too will die. That understanding humbles you. You come to understand that ultimately it is God who heals, and that you are blessed to be one of His servants, partaking of His divine nature as you exercise His eternal, immutable laws in your work. Professional arrogance and self-aggrandizement have no place in your life. As you work in alliance with God, you taste the real joys of service.

One of the great joys and blessings of life is to be a member of Christ's church — The Church of Jesus Christ of Latter-day Saints. The Church has always placed its highest priority on service to others. What example of loving service could be more profound than vicarious work for the dead, or the bringing of the gospel message to the living? Another aspect of the application of Christ's insistence that we are all brothers and sisters, with all that implies in terms of sibling responsibilities, is found in the work of the Church's Humanitarian Service. Last year, 2001, Humanitarian Service provided more than $92 million worth of goods and cash to the poor and needy of the world in many lands. A few examples of this wonderful work will illustrate both its scope and importance:

> Do not become so involved with the body and the science that you neglect the spirit of those whom you are blessed to have as patients.

- Humanitarian Service, working with the Luis Foundation, Republic Ophthalmology Center, and the Armenian Ministry of Health, has provided funding for the purchase of prosthetic eyes. Without these eyes, many young people have either an empty socket and wear an eye patch, or in some cases, have an obvious disfigurement. It is critical they have a replacement eye for self-esteem, career establishment, and social acceptance. Nearly 300 people between the ages of 16 and 30 have benefitted from this project.
- More than 4,000 cases of tuberculosis have been diagnosed in ten clinics during the last eight months as a result of the clinical laboratory train-

ing project sponsored by Humanitarian Service at Pakuan University in Indonesia. Those diagnosed with the disease are eligible to receive free medication through the government.

Local health officials appreciate the program, knowing that more than a third of the population is infected with tuberculosis (TB). If not treated, an estimated 135,000 Indonesians will die this year from TB.

Doctors from rural, government-affiliated clinics are trained in laboratory procedures during a two-week course conducted by qualified specialists from the United States. Trainees receive equipment and supplies to establish a laboratory to test for diseases including tuberculosis, malaria, parasitic infections, and leprosy. The first ten laboratories were established following training in January, 2001. Twenty more laboratories were created later during the year.

A report of this project will be presented at the annual meeting of the American Society of Microbiologists scheduled to meet in Salt Lake City in 2002.

- The J. P. Rizal Memorial District Hospital in the Philippines is the sole government charity hospital in an area where only one in ten patients can afford to pay medical bills. In July 1999, Latter-day Saint Charities donated medical supplies to the hospital, including wheelchairs, beds, and a portable x-ray machine.

  Dr. Lagos, the former doctor in charge who initiated the request for assistance, was so excited about the delivery that he left a party and drove an hour to see the unloading of the 40-foot container.

  Upon arrival, the hospital had no unloading equipment. Sister Henriksen, co-country director in the Philippines writes, "When shear muscle power wasn't enough to unload the portable x-ray machine, Juancho Gallano, from the First Lady's office, went to the Coca Cola Bottling Plant about a mile away and requested the use of their forklift and a driver to help unload the container. They were very willing to help, which cut the unloading time in half, saved the x-ray machine from falling, and the men from developing hernias."

> You will be a better person, and a better doctor, as you immunize yourself through consecration against unrighteous pride, anger and intellectual arrogance.

- In 1999, over 11,000 pounds of medical equipment was shipped to the Regional Center for Disaster Medicine Emergency and Ambulance Care in Nakhodka, Russia. The center provides ambulance service and emergency medical care primarily in response to natural disasters, auto accidents, and industrial accidents.
- A significant number of Zimbabweans have severely deformed or no legs due to birth deformities, accidents, or military injuries. Because wheelchairs and other walking instruments are expensive, some of these people have no means of mobility, except by crawling or being carried.

  In early 2000, Latter-day Saint Charities donated crutches, wheelchairs, walkers, and canes to the Harare General Hospital. This contribution helped at least 55 disabled people access the marketplace, neighborhood, and outdoor latrines. Those who distributed the equipment were impressed with its quality.
- The Tbilisi Psychiatric Hospital is a state-owned facility caring for approximately 170 people in the Republic of Georgia. Its goal is to provide patients with rehabilitative care to return them to society or to have a better quality life at the hospital.

  The hospital had property and an unused building that with repair would support a dairy operation. The Church provided funds for 15 cows, a bull, remodeling, and a tractor. The dairy now serves the hospital with milk, and the excess is sold to supplement other patient services. Patients also work at the dairy as a part of their therapy, learning responsibility and self-reliance.
- In May of 1997, one doctor and two nurses traveled to China to continue a neonatal resuscitation (NRT) teachers training program. The training was conducted in three cities: Ningbo, Huai Yin, and Changsha.

  NRT is a modern technique to revive infants with serious interruption of breathing. It is proven to save thousands of infant lives annually.
  A total of 151 health care practitioners completed the two-day course. In addition, in Huai Yin, another 38 physicians and nurses received an amended six-hour training course taught by

selected, newly certified trainees. Several practitioners traveled 27 hours by train from inner Mongolia to reach the training site.

Fourteen complete sets of training equipment ($15,000 value) were delivered to appropriate organizations, primarily the Ministry of Health (MOH).

- An electronic connection has been set up between the Eccles Medical Library at the University of Utah and the National Medical Schools in Belarus, Macedonia, Mongolia, Bulgaria, Romania and Albania.

A final story illustrates how serving helps the giver as much as the receiver. It reads as follows:

"It was the story of the loaves and fishes — how Jesus was moved with compassion toward the 5,000 who were hungry and had little to eat — that struck a chord in the heart of Steven B. Watts, president of the Gresham Oregon South Stake.

"The images of the millions who are hungry in the world today, children without parents and without homes, babies being wrapped in newspapers because there are no blankets — these images struck him as well. If Jesus fed the 5,000, he wondered, why couldn't the members of his stake prepare materials to benefit 5,000 needy children in the world?

"The task would not be an easy one. Assembling that many kits for newborns and school children would require 10,000 cloth diapers, 5,000 yards of knit fabric, 5,000 bars of soap, 10,000 pins, 7,500 pencils and a half-million sheets of notebook paper. When he discussed the idea with members of his stake, however, he marveled at their response. Ward councils immediately went to work making assignments. Everyone helped from the high priests to the children in the Primary. The Stake's youth committee decided to devote their upcoming youth conference to the activity. Wards devoted Friday night and Saturday morning socials to sewing, stitching, and cutting.

"Everyone wanted to take part. One sister personally sewed 117 blankets and booties. Another sister in a retirement home and afflicted with arthritis slowly crocheted 100 pairs of booties. Two young women sewed nearly 250 blankets. Another woman who had the use of only one hand sewed 40 blankets and dozens of infant gowns.

"Neighbors who were of other faiths wanted to help as well. At times, homes were filled with 20 or more people who helped with the project. A young man enlisted the help of a local elementary school in pulling together items for educational kits as part of an Eagle Scout Project.

"The response was so enthusiastic that President Watts raised the goal from 5,000 to 7,500 and then again to 8,500. When the kits were finally totaled, members of the Gresham Oregon South Stake had assembled more than 9,000 kits.

"They weighed more than ten tons and filled a semi-trailer. They included enough chalkboards to cover 7,700 square feet, enough erasers to fill ten Volkswagens. If all the pencils had been laid end to end, they would have stretched for three miles. The paper would have made a stack 180 feet high. The soap and chalk weighed as much as two mid-sized automobiles.

"One member of the stake said, 'It took me two 8-hour days to complete the trimming of the blankets and I was beating myself up because they weren't perfect... I went home thinking I would continue to give money but that it wasn't helping to have me sew. Then the sweet spirit of the project whispered to me that my heart was right. The receivers wouldn't care if my blankets weren't perfect. They would feel the warmth of the gift from the heart.' Another wrote, 'I felt the overwhelming love for people I didn't know.'

"As they worked together, they discovered the joy that comes from serving. They discovered that their small offering, when combined with the love and sacrifice of others, could multiply and touch the lives of thousands of others."

How blessed you are as physicians to be called to wear out your lives in the service of others. Any sense of personal sacrifice in doing so is swallowed up in a profound sense of gratitude for the privilege of serving the Great Physician, even Jesus Christ, our Redeemer and Savior. Of Him I testify as I leave you my love and blessings, and my thanks for who you are, and what you do. In the name of Jesus Christ, amen.

Elder Alexander B. Morrison is an Emeritus member of the First Quorum of the Seventy. This address was given to the Collegium Aesculapium in Salt Lake City on April 4, 2002.

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RESURGENCE *of* PESTILENCE *in* 2001

and the Missionary Program
of The Church of Jesus Christ of Latter-day Saints

by C. DUWAYNE SCHMIDT, M.D.

THE EMERGENCE OF WORLDWIDE EPIDEMICS OF DISEASES have been recorded throughout the history of mankind from plague to tuberculosis, multiple water-, mosquito- and mite-flea-borne diseases, and in recent years the blight of AIDS and hepatitis B. The Lord's scriptures are replete with the "signs of the times" and the prophets have warned and re-warned us to repent and be prepared. The Lord's missionaries have been called in these last days, in spite of the challenges and even the threats of terrorism, to follow the admonition of Jesus, "And he said unto them, Go ye into all the world, and preach the gospel to every creature." (Mark 16:15)

This issue of *The Journal of Collegium Aesculapium* includes reports and experiences of several physicians who are members of our association of LDS doctors. They are part of a large team with multiple skills and talents who serve under the direction of Dr. Quinton Harris in the Missionary Department to prevent, and when needed to help direct treatment of illnesses and accidents. Their goal is to maintain the health of Church Missionaries and minimize the risks of acquiring and /or spreading disease. These medical personnel are also attempting to make sure that missionaries wherever they serve throughout the world, will receive the best available care. Serving our missionaries is a wonderful opportunity and a great way for a physician and/or surgeon to contribute. A brief review follows outlining the opportunities and medical challenges facing the expanding missionary program of the Lord's Church with emphasis on the scourge of tuberculosis.

The Church is growing at a logarithmic rate with currently over 11 million members. It has been projected conservatively by sociologist Rodney Stark that by 2080 there will be 63 million and possibly up to 265 million members. The non-USA/Canadian members now predominate and they are increasing rapidly. As of July 2002, there were 61,302 full-time missionaries serving in the field. About one third of these originate respectively from the following areas: American Northern Hemisphere, American Southern Hemisphere, and "the rest of the world." There is a turnover each year of about 30,000 in order to maintain the current force. These missionaries serve in 335 separate missions that are scattered throughout the world, located in 121 separate countries and representing every continent.

Sixteen Missionary Training Centers (MTCs) prepare every missionary with 4 to 12 weeks of language, culture, disease prevention, and religious instruction. These unique schools are located in Provo, Utah, U.S. (includes separate program for seniors); Argentina, Brazil, Chile, Colombia, Dominican Republic, England, Guatemala, Japan, Korea, Mexico, New Zealand, Peru, Philippines, Spain, and now Ghana. These institutions can instruct at one time a grand total of over 6,300 students.

With the above outlined growth of the church and the worldwide extent of the missionary program, it is clear that medical problems faced by the missionaries will continue to grow, even without an increased percentage of problems.

The types of challenges (medical, cultural, political, logistical and financial) are a study in themselves, and daily are addressed and solved by the Missionary Department. Members of the Missionary Medical Advisory Committee (MMAC) under Dr. Quinton Harris are available as consultants and members have visited all mission areas throughout the world. Currently, there are also approximately 70 LDS volunteer doctors serving as area advisors in the mission fields. These doctors serve in their geographic area and have identified the most qualified local medical facilities. They also assist the area presidencies, mission presidents and missionaries. Other physicians and various consultants are also serving in the Missionary Department as members of numerous committees. These include: Pre-field Screening, Area Doctors Training, Early Release Case Management, Electronics, Database, Web Site Content, Drug/Pharmacy, International Nutrition, Public Health, Coordination, and Medical Service. There have been or are currently serving about 150 physicians in this program. This is in addition to numerous nurses and other medical personnel in the field. One can safely state that there has never been a better medical support system for the Lord's missionaries.

The risk and spread of infectious diseases, such as tuberculosis (TB), are not only related to local exposure factors, but also the immune resistance of the missionary and the unique social circumstances of their environment. Missionary service is stressful and requires physical and emotional reserves. The exclusion and treatment of pre-mission health problems is often difficult. This is especially the case in foreign countries where medical resources are limited, relatively expensive and not reliable. Foreign missionaries with undiagnosed disease (such as TB) may be assigned directly to the U.S. (Provo) MTC, and North American missionaries may be sent directly to foreign MTCs where they room with and subsequently serve with native missionaries who may have disease. Foreign MTCs may have a limited ability to medically screen missionaries on their arrival. As missionaries serve in the field in high-risk areas, many may be exposed to contagious diseases. Other potential problems include: limited and inadequate local public health facilities, customs restrictions, the absence of standard Mantoux 5TU precipitated protein derivative (PPD) testing material and medications, and/or available reliable chest radiographs with an accurate interpretation. All of these issues are now being addressed and solutions developed.

Why has tuberculosis become such a problem? Have we not been told that TB in the U.S. was no longer a problem? The following brief review will address these issues as they relate to the missionary program. Details regarding the diagnosis, epidemiology, and treatment of this disease are too complicated to be covered in depth in this article, but TB has been discussed in detail at recent scientific meetings of our organization. I will refer, however, to recent authoritative publications that provide information that anyone involved in the care of those with this disease should be familiar with. These papers, along with current and past missionary experience, provide the basis for the current Missionary Department policy in managing tuberculosis.

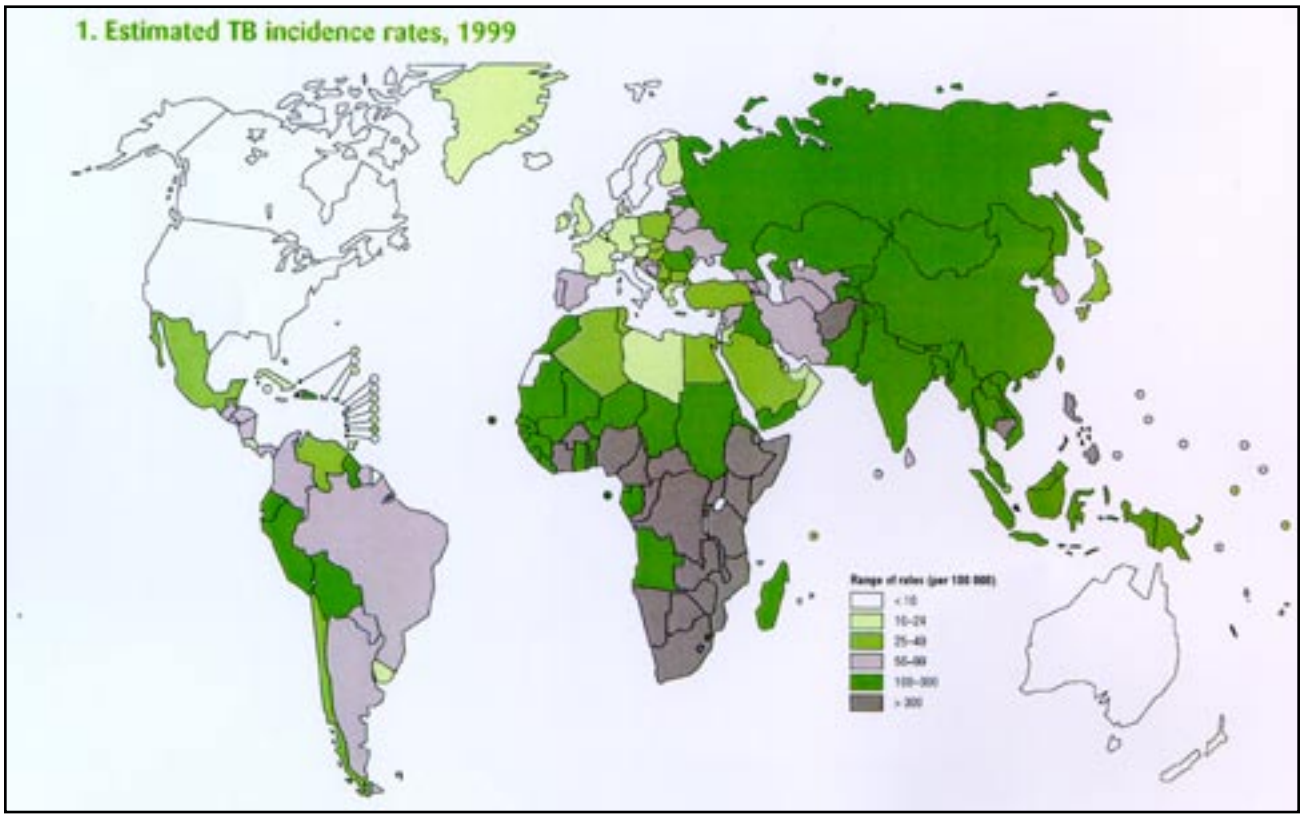
After the introduction of anti-TB medication in the late 1940s, there was hope that TB would soon be eradicated. In the U.S. there was a steady decline in the incidence until 1985-92 when a 20% increase occurred. Major factors contributing to this were: a deterioration of the TB public health infrastructure, the HIV/AIDS epidemic, immigration of infected people from countries where TB is common and their subsequent association in congregate settings. LDS missionaries who have recently been found to become infected in the U.S. have usually had their disease traced to close exposures with humble, poor and teachable people with active TB found in the above high-risk groups. Another public health concern for missionaries is that although the overall number of TB cases in the U.S. is again decreasing, new TB cases continue to be reported in every state. Also resistance to INH is now found in 4% of new cases and multidrug-resistant TB (MDR TB) during 2000 was identified in 45 of the 50 U.S. states.

With the Church expanding worldwide, of greater concern is the striking explosion of tuberculosis outside of the United States. World Health Organization (WHO) data show that there was a 13% increase from 1993 to 1996. New estimated TB incidence data (1995-2000) from the WHO suggest that the annual rate of increase in TB is 3% globally, 7% in Eastern Europe, and over 10% in the African countries that are most affected by HIV/AIDS. (See the latest WHO 1999 estimated TB incidence maps on the next two pages.) One-third of the world is infected and 2 to 3 million people die from the disease each year. In 1990 there were more deaths from TB than all of those occurring from leprosy, tropical diseases, AIDS, malaria, and diarrhea. Currently with the progressive epidemic of AIDS, about 50% of AIDS patients are dying of TB, and resistance to HIV and *Mycobacterium tuberculosis* medications are rapidly spreading. Those countries facing the greatest challenge are located in Asia, Africa, Eastern Europe, Russia, Africa, and selected areas in Central and South America. Multidrug-resistant TB is an increasingly serious problem, especially in Eastern Europe. For example, in Ivanova Oblast close to Moscow, the total primary drug resistance (strains with no history of prior therapy) prevalence is already close to 30%. Acquired resistance is an increasing problem and is found in a patient who has received prior and inadequate treatment. Therapy of

these MDR cases is not possible and/or successful in most cases, and the resistant organisms are rapidly being spread to other areas of the world. Missionaries are being exposed and unfortunately some are being infected as they teach. However, early diagnosis and prompt appropriate therapy for these missionaries is effective and is the objective of the Church's missionary public health program.

Tuberculosis is spread from person to person through the air. When a person with pulmonary TB coughs, speaks, etc., droplet nuclei containing *M. tuberculosis* are expelled into the atmosphere. These tiny particles (1-5 microns in diameter) can remain suspended and viable in the air for hours. If another person inhales air containing these droplet nuclei, they reach the alveoli, and are ingested by alveolar macrophages. They then multiply intracellularly and are released when the macrophages die. These bacilli can then spread through the lymphatic channels to regional lymph nodes, and then through the blood stream to more distant tissues. The areas where disease is most likely to develop include the apices of the lungs, the kidneys, brain, and bone. If the immune system is intact, then most of the bacilli, are killed and the body builds a "granuloma/s" to contain the AFB. At this point the person has a TB infection and not disease and is not contagious. This "latent" form of TB can be detected by finding a positive tuberculin skin test (TST) with no evidence of active disease. It may take 2 to 12 weeks for the infected person to develop a positive reaction. Of those who have close contacts with someone with active disease, about 20% will become infected. Of those who are infected, 5% will develop disease in the first two years after infection and another 5% will develop disease sometime later in life. The risk of active disease increases significantly when the subject has any condition that impairs the defense systems of the body. For example, the risk is 3 times greater with diabetes and 100 times greater with an HIV infection. Based on the above pathogenesis of the disease, it is now recommended that the clinical classification system for TB be used.

The complete medical evaluation for TB includes a medical history, a physical examination, a Mantoux tuberculin skin test, a chest radiograph and appropriate bacteriologic or histologic examinations. The history may be non-specific. but usually includes respiratory symptoms, a potenial exposure, risk factors, previous treatment, etc. The physical examination cannot be used to confirm or rule out TB, but it can provide valuable signs and information about the patient's over all condition and other factors that may affect the prognosis and how TB should be treated. Approximately 20% of TB cases are exclusively extra-pulmonary such as meningeal, renal, and bone The standardized Mantoux 5 TU TST has been statistically correlated with risk factors and the mm induration (5, 10, or 15 plus) that guide the clinician in the interpreta-



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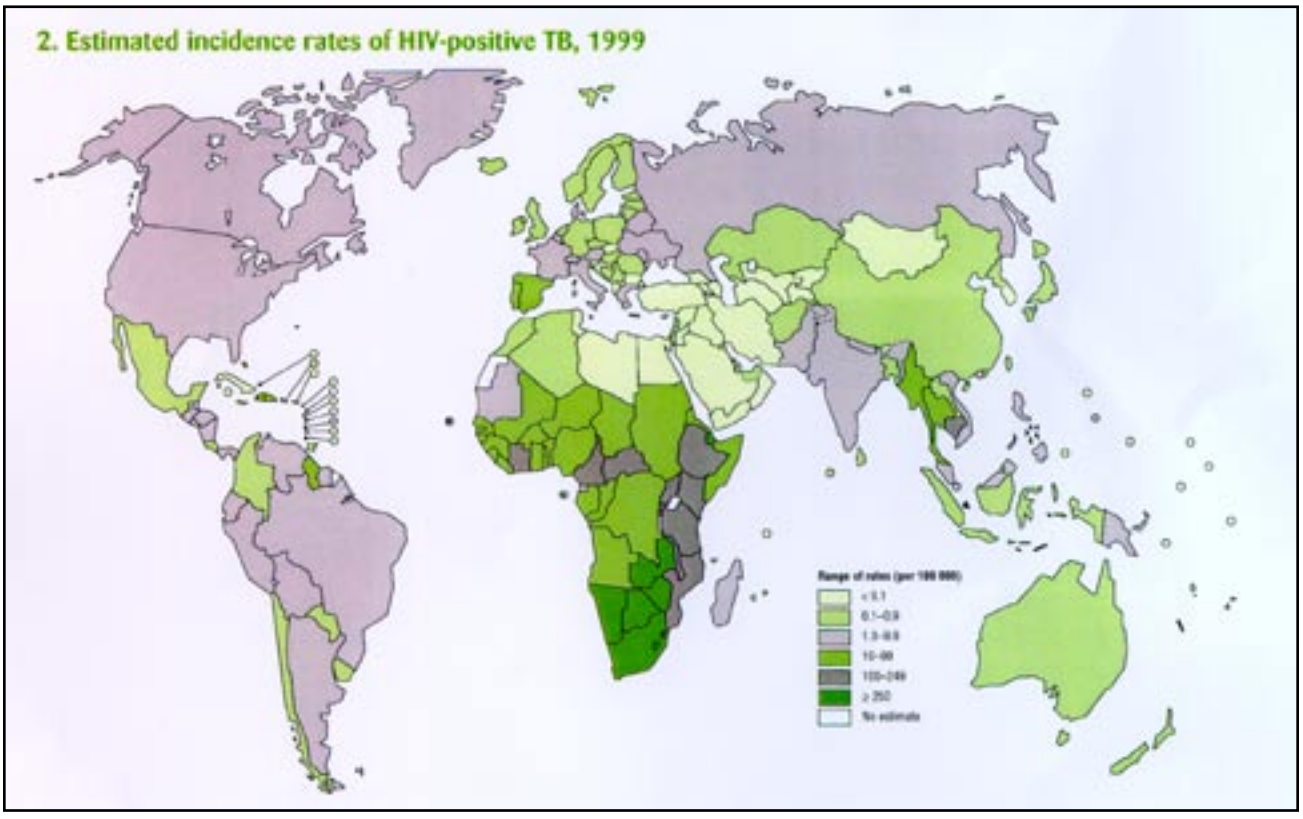

Source: World Health Organization

tion of what is a "positive test." Unfortunately, there are factors that may cause a false-positive and false-negative reaction. But a properly performed and interpreted test is still the best tool we have to establish the presence of AFB in a person and for diagnosing "latent" disease. A two-step TST is advised to reduce the likelihood that a boosted reaction will be misinterpreted as a recent infection. The chest radiograph will often show abnormalities in the apical or posterior segments of the upper lobes or the superior segments of the lower lobe. The X-ray findings cannot, however, confirm the diagnosis of TB. Diagnostic microbiology is essential in making the diagnosis of TB and may include presumptive findings of a positive AFB smear of sputum, bronchial washings/brushings, or a biopsy of tissues. Newer fluoro- chrome staining techniques have made this microscopic examination faster and more accurate. Cultures with drug susceptibility testing are essential to confirm the diagnosis and direct therapy when drug resistant TB is suspected. Multiple specimens should be submitted. The newer Nucleic acid amplification tests and other methods for amplifying DNA and RNA may facilitate rapid detection of microorganisms. The BACTEC radiometric liquid medium is faster than conventional methods for growing the organism and for determining susceptibility to first-line TB medications. With the help of a modern microbiology laboratory, results can usually be obtained within 7 to 14 days.

The most effective therapy of disease is prevention. This requires the early identification of active/contagious cases with subsequent isolation precautions and prompt appropriate therapy with monitoring.

The use of BCG vaccinations as used in many countries has very limited value and only has been proven to reduce the spread of infection in children to extra-pulmonary sites. BCG is contraindicated in persons with an impaired immune response, since active disease can be initiated with the BCG organism. BCG therapy can lead to false positive TST results that can potentially impair our ability to diagnose latent infections and needed epidemiological studies. The CDC therefore does not recommend this therapy except in unusual circumstances and also recommends that we ignore, when doing our TSTs, the fact that BCG has been given in the past when interpreting the TST. Therefore tuberculin skin testing is not contraindicated for BCG vaccinated persons. The diagnosis of latent TB and treatment for latent TB should still be considered for any earlier BCG vaccinated person whose skin test reaction is 10 or more mm of induration when risk factors for infection are present.

The treatment of latent TB infection (LTBI) is now considered by the CDC as essential to controlling and eliminating TB in the United States. But active disease must first be excluded. Treatment of LTBI substantially reduces the risk that TB infection will progress to active

disease. The decision regarding initiation of therapy is based on risk factors, availability of needed close monitoring, and pre-therapy screening to eliminate those who have an increased potential problem for liver disease. Currently INH "preventive" therapy should be given for 9 months, when possible, rather than six, is cost effective and will reduce the incidence of developing active disease by 80 to 90%. Details for the management of latent TB are given in the references. These recommendations, as applied to LDS missionaries, have on occasion had to be modified depending on the origin of the missionary, location of the mission, availability of adequate monitoring, funding and other factors.

In recent years, the treatment of TB disease has been refined, and therapy, when given properly is more effective, shorter in length of time, easier for the patient, less expensive and safer. For most patients, the preferred regimen consists of an initial 2-month phase of four drugs: isoniazid (INH), rifampin (RIF), Pyrazinamide (PZA) and ethambutol ((EMB) followed by a 4- month continuation phase of INH and rifampin. Streptomycin may be substituted for ethambutol, but must be given by injection. This first-phasetherapy program can be reduced to three drugs when drug resistance is not present. Drug resistant cases may require prolonged "second line" medications that are expensive, difficult to give and toxic. Other therapeutic modifications are needed in different circumstances and with different risk factors. Patient adherence to the drug regimen has been significantly improved by using directly observed therapy (DOT) and twice or three times /week protocols. Before initiating therapy, adequate cultures should be obtained with requests for drug sensitivity testing, along with baseline laboratory studies. Initial isolation is essential until the patient is not contagious (usually safe after two weeks of the above medications). Similarly, public transportation should be avoided and masks used. Adequate monthly monitoring (clinical and laboratory as needed) is essential. Multidrug-resistant TB, immune suppressed subjects, pregnant, nursing mothers, and extra-pulmonary TB may require modified regimens. Active TB is a reportable disease. Coordination with local TB Public Health facilities is advised and can be very helpful. Refer to the references for therapy and management details. Expert consultation is advised.

In summary, the current LDS Medical Public Health Committee's objectives are to prevent infectious diseases (TB) from entering the area MTC and the assigned mission field and to prevent spread of illness. This is currently accomplished by requiring pre-mission screening for the presence of TB with a medical examination, standard 5TU TSTs, and when appropriate, chest x-rays. Repeat screening may be needed as a missionary enters a MTC. Active cases must have proof of cure before a call can be initiated. During service, any signs or symptoms of TB or history of significant exposures should be evaluated with appropriate medical studies, epidemiological investigations, and monitoring. When possible, missionaries with latent infections should be considered for INH therapy. This may not be possible for "foreign" missionaries serving outside the U.S. Most active cases of TB disease, when no longer contagious, should be sent home to complete therapy. Every missionary who has a negative TST should have a repeat skin test on his/her release through local TB Public Health resources, and if positive, seek appropriate therapy. Senior missionaries are advised to be screened and managed in a similar manner.

This resurgence of pestilence, including the "White Plague" (TB), is undoubtedly coming to pass as prophesied. In the Lord's service, physicians must work together with their medical skills and spiritual strengths to preserve and protect the missionaries and those they contact.

C. Duwayne Schmidt, M.D., FACP, FCCP, is a retired pulmonologist residing in Salt Lake City, Utah.

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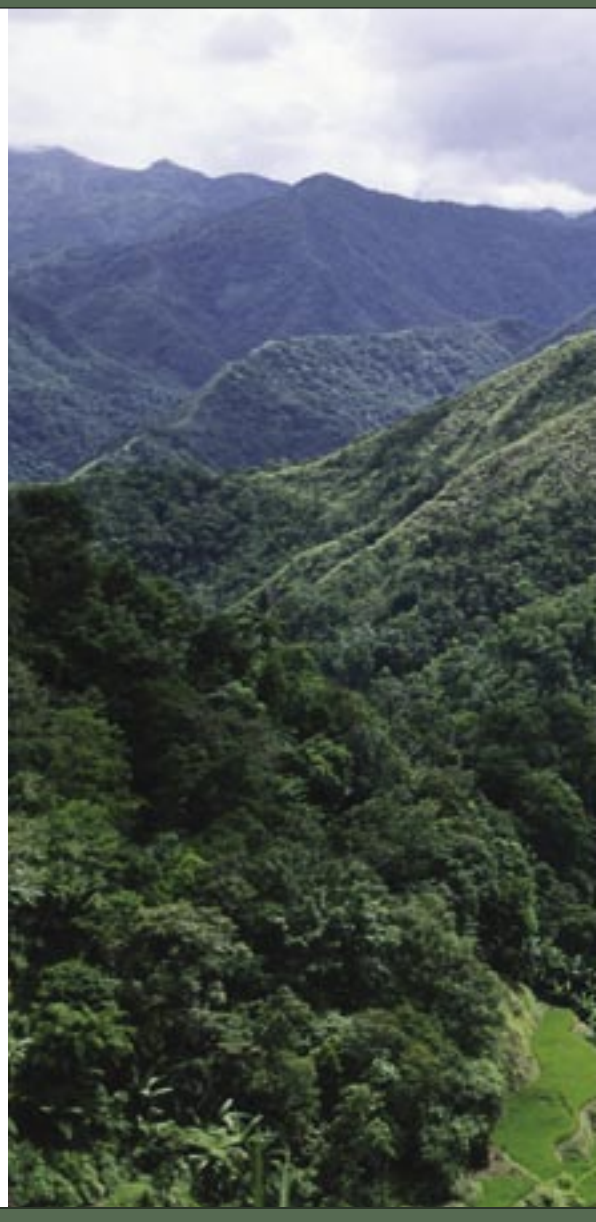
A Gospel Cure for Doctor's Discontent — *the rewards of* Missionary Medical Service

Allan H. Barker M.D.
Mission to the Philippines



Dr. Jerome Kassirer, an editor of the *New England Journal of Medicine*, wrote a classic editorial in 1998 titled "Doctor's Discontent." He succinctly described the many pressures on present day physicians, including the loss of control of decision making, both in medical and surgical care, and in the medical economic environment. This situation afflicts both academicians and regular practitioners. I found myself in general agreement with his observations as I had been gradually phasing out my multifaceted career and was trying to organize the many family and financial matters that needed to be taken care of in order to prepare for a missionary application to be submitted.

The process seemed almost overwhelming. I silently hoped for a non-medical calling, as my general medical experience had been very limited over the past ten years, and I felt generally unprepared for what I feared might be expected of me in a primarily medical missionary calling.

Thus, the call to serve as area medical advisors in the Philippines was a shock, but a blessing far beyond any expectation. The fulfillment of many kinds of needed service brought gratification for our efforts, as we were able to assist hundreds of missionaries in dealing with the physical and emotional challenges that were confronting them in their work in this difficult environment.

After six months at home we are still relishing the experience of our 18-month immersion into a particular niche of the missionary system. I have feelings of satisfaction, joy, and amazement for the whole event. Clearly, we were guided, supported, directed, and sustained by the Lord in all that we did, and in our own physical capacities. I now have a sense of a proper completion of a medical career that seemed not quite fulfilled prior to the mission. Despite a marvelous forty-three years of great opportunities and success in my professional life, the last few years were distressing to me, as the ability to make decisions regarding my own medical practice was progressively eroded by the change in status from management to employee that has taken place for physicians in the "managed care" setting that has now engulfed the medical service world.

I am now smiling broadly again. The discontent and dismay I have felt with the recent trends in medical practice have been largely forgotten in the process of giving some meaningful service to further the purposes of the Lord in spreading the gospel.

Why has this mission resulted in such feelings of success and gratitude? The hours were often as long as those in residency years, and physical fatigue was a real factor. Amazingly, we enjoyed living in our small apartment with a total area of 480 square feet. It was pleasant, had a beautiful view of the lovely Manila temple, was surrounded by gorgeous landscaping, was air conditioned, and very sufficient for our needs, and email made the world seem small.

The heat, humidity, and air pollution were formidable. The dirt in the city, the terrible traffic, and the obvious distressing poverty of so many of the people took some time to adjust to, but these factors never really affected the successes of each day.

Why was each day a success? Can this type of mission call be a similar success for others?

There are some obvious answers that come to mind, at least in my case. The pleasure of new environmental experiences, new friends enlarging your life, and real, immediate benefits to those you serve brings joy to the work. Perhaps some details of my medical missionary service in the Philippines will be of interest to other LDS physicians considering their future retirement plans.

From essentially ground zero in 1965, at the time then-apostle Gordon B. Hinckley really initiated full-scale missionary work in this island nation, a remarkable acceptance of the gospel has taken place in the Philippines. There are now 13 separate missions, with Area Headquarters in metro Manila. Church membership has now grown to over 450,000 in this largely Catholic country, which is the only Christian nation in Asia. Each mission president has 150-200 proselyting elders and sisters, for a total serving in the country at any one time of about 2,200 to 2,500 missionaries.

During the past two years, there have been approximately 30,000 convert baptisms per year in the Philippines, which is approximately 10% of the baptisms throughout the world. During my stay, slightly more than 50% of the missionary force in the Philippines was Caucasian. By the time this is printed, probably half the missionaries are Filipino elders and sisters, who are trained in the Missionary Training Center in Manila. The MTC is very active, with an intense training period of 19 days, and only 1-2 days between new classes. Currently, new missionaries are coming for training and temple endowment from India, Pakistan, Singapore, Cambodia, and Hong Kong in small, but increasing numbers.

Each student must have a review, or repeat, of the physical exam that accompanied the application; a review and often a re-do of necessary lab work; immunizations; and a review of chest X-rays that were done before entering the MTC. Any inadequacies or inaccuracies must be corrected. It is essential that contagious disease that could be a significant risk to their teachers, subsequent companions (very often American elders or sisters) investigators, or others be identified or ruled out, and, if present, then appropriately treated.

Although the Philippines are an English-speaking mis-

sion area, there is a significant communication problem with many of the Filipinos, especially with medical matters. Denial of illness in order to enter the missionary system is a very common event. Many medical problems are not detected until after arrival at the MTC.

X-rays taken for the application process are often of unreadable quality. They are usually taken many months before the applicant reaches the MTC. The films are often not properly interpreted according to the usual standard of American pulmonary specialists even when the technical quality is satisfactory. In a few weeks of seeing sick missionaries in the field, it became evident from the frequency of the occurrence of active TB appearing in the missionary force that the screening process taking place in the MTC was inadequate.

With the cooperation of the area presidency and President L. Stephen Richards of the MTC, who is a highly skilled cardiovascular and thoracic surgeon, and a former colleague of mine, we embarked on the task of doing a proper entry exam. This had to include our own intradermal PPD skin testing with 5 TU materials on all missionaries, excepting those that already had a prior diagnosis of treated TB. The routinely negative tests reported on the pre-entry examinations were erroneous.

We then needed new, technically adequate chest films, (including apical lordotic views when necessary) to evaluate their current condition, because TB is known to be epidemic in the Philippines, and a negative pre-entry chest film 6-12 months earlier might not represent the situation on arrival at the MTC. Because of the distant location of good hospital X-ray facilities, and totally unpredictable traffic congestion, getting the missionaries to the hospitals for new X-rays was a daunting task. The problem was often compounded by the need for some repeat films still needing to be done because of lack of technical screening for good quality films before the patient left the hospital. This protocol error resulted in radiologists commonly attempting interpretation of films that would not be accepted for reading by an American radiologist.

Once good films were available, they were over-read by myself in company with a highly competent American Board certified pulmonary specialist (who also had American Boards in Internal Medicine, Critical Care Medicine and Sleep Medicine). This remarkable lady, Dr. Ruth Divinagracia, had trained at Montefiore Hospital in New York City and served on the Staff at NYU where she had extensive experience with tuberculosis in the AIDS population there before returning to the Philippines to start her own practice. She is a marvelous physician in every respect, with a total command of English, Tagalog, Cebuano, Ilocano (her native dialect) and many of the other Filipino dialects.

Spending many hours with her in examining patients and films was a tremendous education for me, and a great, great blessing for the missionaries, both natives and Americans, whom she treated with such skill, compassion, and interest. Later on, as we needed extra help, another young American trained pulmonologist, Dr. Martin Lansang, served us in the same way. All final diagnosis and treatment for tuberculosis was determined by one of these two capable specialists, who continued to see the same patients at two months, or at other follow up intervals, when new X-rays and repeat clinical exams were obtained. In most cases, I was present, observed the exams, visualized the films, and interacted with the missionaries and facilitated the acquisition of the medications and whatever course of action was necessary thereafter.

> From essentially ground zero in 1965, a remarkable acceptance of the gospel has taken place in the Philippines. There are now 13 missions, and Church membership is approaching half a million.

In cases where active disease seemed most likely to be present on the basis of suspicious X-ray findings, clinical history and examination, and most often positive (10. Mm or more) PPD skin test result, the decision was made to proceed with two months of intensive treatment. This was a four-drug regimen of INH, ethambutol, rifampin, and pyrazinamide (PZA) all combined in single tablets. The dose calculated according to patient weight was administered each morning, and was required to be taken under direct observation by another person, usually a family member, who then initialed a prepared form. A vitamin preparation including B6 (pyridoxine) was given concurrently in all cases. Each week, a priesthood adviser (bishop, branch president, mission president or other assigned to this task) was also asked to initial the compliance form as well as the original observer. This is the process known as the Directly Observed Therapy System (DOTS), which, at least in the Philippines, is really essential to demonstrate medical treatment has been truly given in adequate doses over a proper time period.

As missionaries in a distant land, the Barkers were able to sample the local delights...

At the end of the two months, the patient was re-examined, weighed, and had repeat chest films, again with the same review process and comparison with the earlier films. The proper completion of the DOTS forms was absolutely insisted upon, although in some cases we had to get written/verbal contact with observers when the document had been lost or destroyed. Non-compliance resulted in more treatment before re-entering the mission or the MTC. If there was satisfactory clinical evidence of improvement, plus improvement or stability of the X-ray, the "maintenance dosage" of the three-drug tablets (no PZA) was started, to be continued for another four months of treatment, using the same DOTS program. Laboratory tests for liver function were done before onset of treatment, and on the basis of clinical indications after the "maintenance dosage" exam at two months. The person was then allowed to proceed back into the proper place in the missionary training program, or into the assigned mission field.

Only three individuals sent home for such treatment from the MTC failed to return to the missionary program. Virtually all of the treated persons showed remarkable improvement in their energy, enthusiasm for the work, and a sense of well-being. In contrast to the dismay and unhappiness manifested when the diagnosis was made, they voiced appreciation and satisfaction for having had their disease discovered and treated successfully.

The area presidency was concerned about the possibility of undetected disease in missionaries in the field who had not passed through our screening process. As a result they arranged for additional medical help to undertake a clinical and X-ray screening process at selected facilities in the various missions. Dr. George Snell, a previous mission president in the Bacolod Mission, had recently returned from missionary medical service in Central America. He and Dr. Gordon Russell, a recently retired radiologist from LDS Hospital in Salt Lake City, were recruited for a two-month period to accomplish this task, along with some assistance from me. They did a marvelous job, and we found 30 more presumably active cases, including some people working in the mission homes, who needed treatment.

During this same time, we reported our impressive findings, and struggled with the severe logistical problems of getting adequate X-rays in Manila hospitals. The great disruption to the MTC training program as we took students out of instruction periods was severely impacting the MTC function. A plea was made to consider develop-

ing a good X-ray facility for the missionary program in our own building. The area authorities and the general authorities in Salt Lake approved the project after the tremendous assistance of Dr. Russell in determining the proper equipment and funding necessary for our needs. Then we were blessed by the provision of detailed design and installation supervision provided by a super radiology technician, brother Pat Bendall, to assist Dr. Russell. He and his wife took vacation time from regular work at Intermountain Health Care to come to Manila. After a fantastic, around-the-clock effort by our church architects and local contractors, we had a beautiful, state of the art X-ray facility in our own administration building completed in three weeks after work was started to build it. The seemingly impossible was a reality! Dr. Russell, Brother Bendall, (without whom we would not have succeeded) and their wives were fantastic. Sister Barker, along with others, was now relieved of the punishing, lengthy multiple trips to the hospitals with the missionaries, and the missionaries were back in class. This resulted in earlier identification of possibly contagious students, and reduced disease exposure to others in the very close quarters of the MTC.

A few weeks later, after the departure of Dr. Russell, we welcomed the arrival of a successor radiologist, Dr. Ute Knowlton, and his wife Gail. They now man the ramparts of the radiology suite. A program is in place for every departing missionary (Caucasian and Filipino) to get chest film surveillance for evidence of suspected TB before returning to his or her home. In October 2000, we got other missionary help with the arrival of Sister Barbara Young, R.N., and her husband, Frank (a somewhat over-qualified electrical engineer) who quickly took over many aspects of PPD testing, immunizations and transport, etc., of entering missionaries. Sister Young now initiates exit PPD testing on all the departing American missionaries at the same time as the exit X-ray exams. This is to identify converters from negative to positive responses; so as to implement follow-up studies on those will need treatment for latent TB after returning to the United States.

By doing our own PPD testing for a full year, we have learned that 58% of about 1,000 tests on the native missionary population have positive responses to the level of 10 mm. of induration. If one uses the 5 mm response as positive, as is usually recommended in areas where the disease is prevalent with a high likelihood of exposure, the rate of positive response exceeds 75%. By our clinical and

... but beware the Dengue fever, which can be fatal! (Hence the need for an express lane — see the sign.)

"I Needed a Blessing"

by Brandon J. Miller

Editor's note: This story first appeared in the Sept. 2001 Ensign *and took place during Elder and Sister Barkers' missionary service in the Philippines.*

It was the rainy season in the Philippines and had been raining all day. Rain often brought unwanted creatures into our house-usually spiders, rats, and such.

As my companion and I arrived home after a day of proselyting, we noticed a light on at our neighbors' house and we thought we would visit them. We decided to stop at our house and pick up some photographs of our families to show them.

We kept the pictures on the bottom shelf of a bookshelf between our beds. As I reached for mine, I suddenly felt a pain in my right hand. Looking down, I saw that a snake had just bitten me.

I called to my companion, Elder Regis, and he ran to see what the problem was. I showed him the blood on my hand and said I'd been bitten by a snake.

A neighbor ran in because of the commotion and helped us look for the snake. We found it when it struck from under the bed at a board Elder Regis was holding. The neighbor cried out, "That's a Philippine cobra!"

Elder Regis killed the snake. I realized I was getting dizzy, so we rushed to Bishop Rotor's house because he had some experience treating snakebites. He hurriedly began to do what he could to help me.

My chest was becoming heavy, and it was hard to breathe. A darkness seemed to cloud my thoughts, and I began to lose consciousness. Then I had a distinct impression that if I wanted to finish my mission on earth, I needed a blessing.

I stayed conscious long enough to say, "Will you give me a blessing?"

The bishop answered, "Yes, just let me finish this first." It was hard for me to stay alert, but the impression came again, extremely strong, that I needed a blessing now. I could not wait. This time I said in a commanding voice, "Give me a blessing!"

I don't remember the words of the blessing my companion and Bishop Rotor gave me. But I put all my trust in the Lord and His priesthood. During the prayer I began to come to my senses, and I vomited repeatedly. As I heard the final words of the blessing, the vomiting stopped. I was aware of my surroundings and felt a warm feeling of comfort and love fill my body. I knew my Father in Heaven loved me and that I would be OK.

My zone leader, Elder Howarth, brought to the bishop's home a doctor who was investigating the Church. By this time about two hours had passed. We left for a hospital located about an hour away from where I was serving.

On the way the doctor asked me to tell him what happened. Elder Howarth said, "Doctor, shouldn't we speed up?" The doctor's answer was, "Why? He should already be dead. He is a lucky man." The Philippine cobra is the deadliest snake in the Philippines.

If people say God is not a God of miracles anymore, they don't understand this gospel or His love for us, His children. I know my life was spared and I suffered no lasting effects because of the power of God's word: "And by the power of his word did they cause prisons to tumble to the earth," wrote Moroni, "yea, even the fiery furnace could not harm them, neither wild beasts nor poisonous serpents, because of the power of his word" (Morm. 8:24).

Elder and Sister Barker, along with Dr. Cirilo Tejano, Jr. and his mother in the city of Vigan. Dr. Tejano is the physician who treated Elder Miller, as described in the story.

X-ray definition of probable active TB requiring treatment, we had a 9.7% incidence of active disease. Several individuals whose X-rays were highly suspicious, but had negative PPD responses were treated and responded well. These particular cases looked more advanced on X-ray than many others and the response was slower. Bacteriological evaluation was seldom possible because of the short time frame we had in which to evaluate patients, and the long time period needed for culture growth to take place, We did do smears and cultures on those with hemoptysis or severe coughing, particularly those who were quite ill and were hospitalized. Where smears were positive, they were kept in hospital until three days of negative smears were obtained while on treatment. Despite some slow responses by smear testing on several patients, we did not find any patients who were resistant to the standard multidrug therapy.

Although the TB identification and treatment program was a major breakthrough in my missionary service, it is only a part of the area medical doctor's responsibility. A constant need was to evaluate, and in some cases treat illnesses, accidents, potential surgical emergencies, or other problems that confronted the Mission Presidents in each area.

The medical facilities and physician capabilities vary greatly in the 13 missions. Each mission has some local doctors who provide care, which is for the most part adequate. As expected, the most common problems are respiratory, gastrointestinal, headaches of all varieties, backaches, kidney stones, and skin disorders. Some of these problems, particularly those having a possible need for surgery, require more specialized care, and better facilities than is present in the provinces. This care is best provided in Manila, and it is incumbent on the area doctor to find good doctors to refer patients to, and to follow the patients and make sure they not only get good care, but feel the emotional support of the gospel network around them. We are in a very real sense substitute parents, but with special skills and a special calling. There were many occasions when my medical and decision analysis skills were augmented by the increased insight and the whisperings of the Spirit that came with being set apart for this calling. Although the mission presidents have the responsibility to determine whether or not a missionary should be sent home, or continue to serve in the mission, much depends on the doctor's evaluation and recommendation...a very sobering duty.

Many elders and sisters were sent in to Manila for specialized evaluation and treatment utilizing St. Luke's Hospital and Makati Medical Center, or for treatment as outpatients while being housed in the Missionary Reception Center (MRC), which is a facility unique to the Philippines. This valuable center provides a homey support center while tests and treatments are being done, serves as a post-op stage recovery area after leaving the hospital, and provides a valuable opportunity for the doctor to observe individual behavior and attitudes far better than a brief office visit does. This helped the process of "stay or go" decision-making greatly.

I found that my active involvement and interest in each missionary translated to the same kind of desire on the part of the consultant to render the best care possible. As a result, Sister Barker and I have made many lasting friendships.

Early on, it became apparent that by accompanying the missionaries to the specialist's office when consultation was needed, I could best assess the skill of the doctor, and his or her interest in providing ideal care to our missionaries. I explained the operation of our missionary program, and the time frames we were working in. This was one of the most satisfying experiences I had. It resulted in terminating relationships with some M.D.s, but most gratefully in finding some new, wonderful, well-trained, highly qualified physicians who rendered marvelous care to our missionaries. I found that my very active involvement and interest in each missionary translated to the same kind of desire on the part of the consultant to render the best care possible. As a consequence, Sister Barker and I made some great friends among the Filipino physicians, which will be long-lasting relationships.

We now have excellent consultants in general surgery, ENT, infectious diseases, gastroenterology, orthopedics, respiratory disease, dermatology, urology, physical therapy, cardiology, gynecology, ophthalmology, anesthesiology, neurology, radiology, special imaging, and psychiatry. We have special attention from the pathology department at St. Luke's Hospital, including the research lab that has provided valuable service for us. The provide much help in diagnosing the many bizarre parasitic, fungal, viral and bacterial diseases that pop up in this tropical land, including sophisticated tests for infectious mononucleosis, and

PCR tests on spinal fluid. I had full availability of all the hospital services at my request.

The gamut of medical problems was amazing. The hot, humid climate with insufficient fluid intake was a major factor in many of the common problems of headaches, UTI's, and kidney stones. The air pollution was sometimes an insurmountable problem for those with allergic, asthmatic, and sinus problems. The typical macho missionary willingness to eat or drink anything their investigators consumed resulted in gastritis, enterocolitis, and the typical chronic "LBM" affliction; that often cultured out E. coli, which didn't respond well to most antibiotic trials. Fortunately, we always had marvelous support from the MMAC consulting specialists in Salt Lake.

We dealt with amebiasis, giardiasis, appendicitis, peritonitis, rheumatic carditis, encephalitis, neuritis, Bell's palsy (frequent), retinitis, every conceivable kind of dermatitis, nephritis, pneumonitis, suppurative osteomyelitis, leprosy, malaria, dengue fever, leptospirosis, cerebral TB, A-V malformations of cerebral circulation with seizures, pseudoseizures, nocturnal grand mal seizures, psychomotor seizures and midline cysts of the brain. We had acute renal failure requiring dialysis, arrhythmias, pericarditis, syncopal attacks, completed strokes, TIA's, and almost every kind of "itis" or "osis" you can think of, and some illnesses that we never could define. Among our senior missionaries we had new onset Parkinsonism, acute degenerative lumbar disk disease, anginal attacks, prostatitis, prostatic carcinoma, obstructive small bowel disease, a pulmonary sarcoma, cholecystitis (also in the young sisters) thrombophlebitis….and the list goes on and on. I didn't mention the assortment of sprains, strains and fractures, and the mental problems, for which I was blessed to have a great young psychiatrist to work with. He dealt expertly with depressions, obsessive-compulsive disorders, frank schizophrenic breaks, hallucinatory events, ADHD, somatization and anxiety attacks and chronic fatigue syndrome.

Being in the Philippines gave the Barkers an opportunity to pause at the monument to U.S. Army General Jonathan Wainwright, a hero of the famed Bataan resistance during World War II.

Upon preparing to leave the U.S. on our mission, Joanne and I received some instruction from Dr. Homer Warner regarding the Microsoft Access program he had developed so we could provide a database of our medical activities, including our interaction with missionaries, doctors, and hospitals in the various areas where we visited. Although this was labor intensive for me, it was a necessary labor, and I'm sure it will become simpler, and easier to accomplish as our MMAC pro-

gram develops further. Our laptop was regularly in use every day and evening, either with data entry, or email links to missionary medical support, or to family and friends at home. We found that having a computer in your own apartment is an absolute must.

A brief summary of some of our important data shows interaction with:

- 18 missions, including India Bangalore, Pakistan, Australia West, New Zealand, Samoa, and the 13 Philippines missions.
- 16 hospitals involved with missionary care
- 76 treating physicians
- 750 individual missionaries with treatment entries, which does not include those seen only in the MTC, or on outer mission visits.
- Over 1,500 direct medical encounters, excluding the TB screening in the missions, or the MTC encounters. There was just too much effort required to enter every encounter in those circumstances.
- 132 missionaries diagnosed and treated for proven active or probable active TB (using the definition noted previously) during our 18 months.
- 3 American elders started on various TB treatment programs for either skin test conversion to positive on PPD testing, or chest X-ray findings after return to the U.S.

In closing, I'd like to provide some final observations. The missionary medical program as organized by Dr. Harris and many others under the direction of our general authorities is clearly providing wonderful support and assistance to the proselyting missionaries in the Philippines and around the world. Although I have described an impressive amount of illness besetting these heroic volunteers in the service of the Lord, it is also clear that the preventive efforts of education, immunizations, repeated treatment for worms, and efforts to prevent malaria, dengue fever, and schistosomiasis have been of dramatic benefit in maintaining or restoring good health. This results in much more effective function of the missionary force, in addition to the obvious primary importance of benefiting and protecting the individual missionaries.

Many missionaries are able to remain in service when the best quality health care is available to them. Often those with complicated medical problems can be effectively treated in the mission field, who would otherwise have to return home.

The opportunity to assist so directly in furthering the spread of the gospel, and in protecting the lives and the welfare ot these heroic young — and older — missionaries is a spiritually uplifting and satisfying experience.

My wife and I were both blessed physically to be able to magnify our callings.

Most of the hassles and stresses causing "doctor's discontent" in the usual practice of medicine at home are left behind. Clinical decision-making is again the province of the doctor, the patient, the parents and the church program. It is always in the best interest of the missionary, without regard for insurance restriction on referral choices, or choice of appropriate treatment medications or surgery.

As a missionary, financial compensation for service is not an issue. You just get to enjoy your work. The pay for service is unbeatable, and the retirement benefits promised cannot be matched!

One can spend as much time in problem solving as is indicated by the situation as the Spirit dictates.

A constant companionship with your own chosen, beautiful, supportive assistant, who mothers the missionaries with that special quality she possesses, is far beyond any help you ever had in your office.

On top of everything else, the whole experience — despite some days of fatigue — was fun. Traveling to new places to relive some of the history of World War II was very intriguing. Visiting Corregidor, the Bataan peninsula death march, MacArthur's landing in Leyte, and the American return to Luzon was exciting. The special spiritual experiences found in repeated visits to the American War Memorial Cemetery in Manila, with Elder Holland speaking on that lawn to hundreds of missionaries, will never be forgotten. Our missionaries are in the Philippines in some great measure because of the valiant efforts of many of the young men and women who gave their lives in the Pacific theater, and who are represented by the thousands of marble crosses in that beautiful place. These and many other experiences were great rewards for our presence in the Philippines. Serving on the Board of Trustees of St. Luke's hospital, our comradeship with other devoted senior missionaries and church employees in the Makati Village Branch…the list of blessings is endless.

I can think of no better way to finish a medical career, and I thank the Lord daily for such a blessing.

Allan H. Barker M.D. is a retired internist/cardiologist and resides in Salt Lake City, Utah. He and his wife Joanne (see following article) recently served as area medical advisor missionaries for the Church in the Philippines.

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My Medical Mission *in the* Philippines

Joanne Gardner Barker

A medical mission!-What could-I do?-Even though Allan and I had planned for years to go on a mission, and we assumed it would be a medical one, it hadn't occurred to me what my job would be.-When the call came to the Philippines area (which is all the 7,000-plus islands), it was indeed as a medical missionary but also as a-proselyting-one.-The wording on my call was-the same as his.-Allan assured me that I could be a great help to him, so we both knuckled down and began sessions with Dr. Homer Warner on how to use his new computer program on keeping track of the sick missionaries — elders, sisters and seniors.-

The Senior MTC in Provo is housed in a former motel and it was a good opportunity to get acquainted with other seniors going all over the world on all sorts of missions — temple, service, family history, public relations, and almost everything else one can think of.-The classes on proselyting we attended were well taught and interesting,-but as we kept traveling back and forth to Salt Lake to learn our computer program, we weren't able to attend all of the proselyting classes.-There was so much we had to learn about medicine in a very foreign country.-The Philippines is an "English speaking" country, and all of the well-educated Filipinos do speak English.-But when we traveled around the country visiting the missions, many of the poorer people could only speak the language native to that area.-Fortunately, we usually had several missionaries with us who all spoke that language, so there were few problems language-wise.

Traditionally, the Church's area doctor for the Philippines lived in Quezon City, part of Metro Manila, in a very convenient area.-Our home was a small apartment in a small apartment-building on the temple grounds.-Sixteen other missionary couples occupied similar apartments-— temple missionaries mainly, but a family history couple and the executive secretary, both husband and wife, to the-area presidency.-One large room was designated as the "common room" where we had weekly family home evening, a large pot-luck dinner once a month and, of course,-various impromptu get-togethers.-Sometimes a group of us would all go out to eat at one of the local fast-food places — Wendy's, The Outback, Chili's, etc.-Most of the American franchises were close by and we knew that the food was good and safely prepared.-And best of all, we could drink the water!-We got to know each other very well and made good (and lasting) friends.-Allan was always "on call" to our apartment missionaries (and all the other missionaries, too, of course).-Fortunately he wasn't needed much at the apartments.-

The temple grounds where we lived are beautifully kept up (as much of the public areas of-Manila are not) with lush green grass, many varieties of tropical flowers — orchids, lilies, bougainvillea, gorgeous-flowering trees and shrubs.-It was like a little bit of heaven on earth.

Allan had two offices — one across the street in the MTC and another in the administration building right next door to it.-This office, because of its size, we called "the cubby hole."-We had the responsibility of taking care of the health of the MTC missionaries.-A new class-(ranging in size from 60 to 90) came in every three weeks.-The first day they arrived, we went over each one's medical records.-This was one thing I could do — trying to find out more about the incidence of TB.-

– "Did your father or mother or brothers and sisters ever have TB?"-

– "Oh no, Sister."-

– "What about your grandparents or your aunts and uncles?"

—-"Oh, no, Sister."

—-"Did anyone of your relatives ever have 'weak lungs'-(a euphemism for TB)?"

—-"Well, my uncle died of weak lungs a few years ago."-

And so it would go.

I loved working with the missionaries.-The ones coming-to-the MTC are usually fairly shy and soft-spoken,-but by the time they leave, they hold their heads high, as they are now ambassadors of the Lord Jesus Christ ready to preach His gospel.-The transformation was always wonderful.

Whenever we had missionaries in the hospital (anywhere from-20 to 90 minutes away, depending on traffic), I would go with Allan to visit them.-The elders and sisters were always glad to see a missionary face, and I felt like one of their grandmothers who could listen to what was wrong, hold their hands or pat their shoulders.-These were special times.

-Another of our interesting "hospital activities" was serving on the board of directors of St. Luke's Hospital.-We met once a week at the hospital cafe for a breakfast meeting with the men and women who ran the business side of the hospital.-They were fascinating people and we became very good friends with many of them.-(There's more than one way to proselyte!)-Allan became very close to the doctors with whom he worked — and to whom he sent the most patients.-I was good friends with many of them as well and we were invited to some of their homes.-They were all fine people.-Before we left we gave a lovely dinner party for the doctors and spouses and invited the area presidency, the two mission presidents and their wives, plus the assistants (APs) and the branch president and counselors from our branch.-We had copies of the Book of Mormon as part of the table decorations and told them each one could have one.-They were all gone at the end of the evening.-Allan also gave each doctor a copy of Elder Ballard's "Man's Search for Happiness."-We felt we had touched their hearts.-Perhaps none of these doctors will ever join our church, but they will understand that we are all sons and daughters of God and that we love Him and His Son Jesus Christ and each one of them, too.

Visiting the different missions was always a great experience for us.-Not only did we often get to stay with the mission president and his wife and get to know them better, but we could travel through a different part of the-Philippines each time.-Each mission had its own unique qualities and we loved finding out about them all.-Of course we held "sick-call"-when we traveled, and checked up on the hospitals, too.-There are many hospitals in the Philippines ranging from the ones in Manila that have every facility (as modern as American hospitals) to ones with dirt floors and metal beds (without mattresses) that sleep 3 to 4 people crosswise.-

The crafts in the Philippines are wonderful to behold.-Because labor is so cheap there, many things can be bought for "a song."-Once a month an enormous bazaar is held in Manila with items coming from all over the Philippines.-All the missionary couples go to admire (and buy) handmade quilts, wall hangings, dolls, knives, nativity sets, clothing, all sorts of things out of wood — furniture, bowls, utensils, toys, etc.

One of most rewarding things that happened on our mission was how close our large family kept while we were so far away.-Everyone had email and when a letter would be sent to us in the Philippines, a duplicate was always on its way to each brother and sister and my 100-year-old mother.... sometimes aunts, uncles and cousins too.-Of course photos came by email and flew constantly across the ocean so we could keep track of how much each grandchild had changed.-Their homes ranged from Vermont to California, Arizona,-Missouri-and Utah.-The 29 grandchildren also exchanged letters with each other and us and would often include crayon drawn pictures and original stories.-As all the children have said, "We've never known so much about each other and felt so much love!"-We were always in each other's prayers and felt the constancy and strength of the Lord's spirit.-One other perk is that our children have told us what a good example we are not only to our grandchildren to serve a mission, but also-to each of our six children to serve missions together when they are seniors.

It is easy to see why such a mission is a great blessing.-We helped keep the missionaries well, met wonderful church members and-Filipino doctors, businessmen and women, spread the gospel by friendship and work, felt the love of the people as we gave-of ourselves to them, strengthened ourselves and our families, all the while knowing that the Lord was supporting us all.-Our mission was humbling and exhilarating.-How truly blessed we were and are.

Joanne Gardner Barker recently served with her husband as area medical advisor missionaries in the Philippines.

Caffeine and Theobromine Content in Yerba Maté

(Ilex paraguariensis, Aquifoliaceae)

Bruce H. Woolley, PHARM.D.[1]
Kenneth J. Hunt[2]
Rex G. Cates, PH.D.[3]
Jiping Zou, PH.D.[3]

[1] DEPARTMENT OF PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY, BRIGHAM YOUNG UNIVERSITY, PROVO, UT USA
[2] UNIVERSITY OF UTAH SCHOOL OF MEDICINE, SALT LAKE CITY, UT USA
[3] CHEMICAL ECOLOGY LABORATORY, BRIGHAM YOUNG UNIVERSITY, PROVO, UT USA

ABSTRACT

Introduction: Yerba maté, also referred to as maté or Brazilian tea is one of the most popular beverages in many South American Countries, consumed in greater amounts even than coffee. It is brewed from the dried leaves and stemlets of the perennial tree *Ilex paraguarensis*. The primary active chemical constituency has been described as a combination of caffeine (levels between 0.3% and 1.5%), theobromine, theophylline, and saponins. Sterols resembling ergosterol and cholesterol are also present. From the literature, we hypothesized that Yerba maté contained as much caffeine as coffee.

Methods: We obtained dried leaf and stem material from eight brands of Yerba maté produced in Argentina and Paraguay and four common brands of domestic coffee. Each sample underwent HPLC analysis and was assessed for caffeine content.

Results: Results showed that the eight Yerba maté products contained an average of 0.95% caffeine as a percent of dry weight versus 1.52% average caffeine content for the four brands of domestic coffee. Coffee contains an average of 0.57% more caffeine than Maté.

Conclusions: The Yerba maté samples in the present study contain an average of 2/3 the amount of caffeine in common domestic coffee products. Therefore, we failed to accept the hypothesis.

INTRODUCTION

Yerba maté, also referred to as Maté or Brazilian tea is one of the most popular beverages in many South American Countries, consumed often in greater amounts than coffee. It is brewed from the dried leaves and stemlets of the perennial tree *Ilex paraguarensis*. The name "maté" derives from the quichua word "matí" that names the gourd that is used to drink the infusion. It is a green-colored stimulating drink that contains varying levels of caffeine and tannin, yet is less astringent than tea. The scientific name *Ilex paraguarensis* was given by the French naturalist and botanist Auguste de Saint Hilaire in 1822. The tree belongs to the family *Aquifoliaceae* and grows between the parallels 10° and 30° (Southern) in the Paraná and Paraguay Rivers' basins. On average, 300,000 tons of maté are produced each year.

Yerba maté is the subject of a German Monograph which lists its uses for mental and physical fatigue, and having "analeptic, diuretic, positively inotropic, positively chronotropic, glycogenolytic and lipolytic effects." (Mate, review). The countries which consume the greatest amounts are Argentina, Uruguay, Paraguay and Brazil. Maté has been used by various cultures as a diuretic, tonic, and a central nervous system stimulant. It has been purported to suppress the appetite, invigorate the body, and affects muscles by reducing fatigue.

The original research on the active constituents of Yerba maté were reported in the mid-1970s through mid-1980's (Alkaridis, 1987; Fossati, 1976). The primary active chemical constituency of Yerba maté was discovered to be a combination of caffeine (0.3-1.5%), theobromine, theophylline, saponins, and 10% chlorogenic acid. Sterols resembling ergosterol and cholesterol are also present. In addition, the leaves of Yerba maté contain several minerals and as many as 15 amino acids (Alkaridis, 1987).

Over the past several years, research was undertaken to show some of the health aspects of maté in an attempt to market Yerba maté as a more "nutritious" replacement for caffeine-containing coffee and tea. The first study was conducted by a Brazilian group who found that Yerba maté might improve circulation, especially in the heart (Gugliucii 1996). Conclusions were that substances in Yerba maté enhanced the oxygen capacity of the body and provided more energy for a longer period of time.

Another group based at the University of Geneva in Switzerland found that Yerba maté promoted *thermogenesis* (Martinet 1999), the body's natural process of burning stored energy to produce energy. This is a known effect

of caffeine. While they found no significant increase in energy expenditure, a significant drop in the respiratory quotient (RQ) was shown in patients who had consumed maté extract, indicating a rise in the proportion of fat oxidized. They did not directly compare the effects of caffeine.

The Popularity of Coffee

The word coffee comes from the word "qahwa" which means wine. When coffee reached Europe in the beginning of the 17th century, it was called the "wine of Arabia". For well over a century, coffee has been a major export from several countries in South America, Latin America, and the Carribbean. More than two thirds of the current world coffee production is exported from these areas (Adrianse 1997). Coffee production has grown by nearly 200 percent since 1950. In recent years a surge in consumer demand for specialty coffees such as gourmet blends, flavored coffees, and organically grown coffees has occurred. Indeed, fashionable coffee bars in many developed countries today are not unlike the coffeehouses of 18th-Century Europe, which flourished when the drink was first introduced.

Caffeine-Containing Beverages

Caffeine is present in the leaves, seeds or fruits of more than sixty plant species worldwide. Except for those which are decaffeinated, all coffee beverages contain caffeine. The amount of caffeine in any single serving of coffee, Yerba maté, or any other caffeine-containing drink depends on:

- the variety of bean or leaf,
- where the bean or leaf were grown,
- how the product is manufactured, and
- the method of preparation, e.g. the length of brewing, and the proportion of coffee/maté to water.

In an effort to determine the concentration of caffeine in maté, we obtained sealed samples of eight commonly sold brands of maté. The samples were from Buenos Aires, Argentina and had been manufactured in Argentina and Paraguay. We also obtained sealed samples of four commonly sold brands of coffee in the United States. Our hypothesis, from a review of the literature, was that the caffeine concentration in the eight brands of maté would be approximately the same as the four commonly sold brands of coffee.

MATERIALS AND METHODS

Plant samples

Samples of Yerba maté (*Ilex paraguariensis*, Aquifoliaceae), which had been manufactured in Argentina and Paraguay, were provided by the LDS Church Missionary

TABLE 1
DIFFERENCE AMONG BRANDS OF YERBA MATÉ IN THEIR CAFFEINE AND THEOBROMINE CONTENT*

BRANDS	CAFFEINE (%)	THEOBROMINE (%)	TOTAL (%)
Cocido (in tea bag)	0.953 ± 0.026^{abc}	0.158 ± 0.035^{ab}	1.111 ± 0.057^{b}
Carrefour	0.693 ± 0.006^{cd}	0.084 ± 0.015^{d}	0.777 ± 0.012^{a}
LaTangvera (in tea bag)	0.830 ± 0.017^{bcd}	0.115 ± 0.021^{bcd}	0.945 ± 0.040^{c}
Amanda	0.642 ± 0.044^{d}	0.095 ± 0.006^{cd}	0.737 ± 0.042^{a}
Taragui (in tea bag)	1.172 ± 0.036^{a}	0.182 ± 0.046^{abc}	1.354 ± 0.079^{e}
Taragui (bulk)	0.962 ± 0.040^{abc}	0.139 ± 0.015^{a}	1.100 ± 0.050^{b}
Nobleza Gaucha	0.772 ± 0.050^{cd}	0.084 ± 0.021^{d}	0.856 ± 0.068^{d}
LaTangvera (bulk)	0.673 ± 0.040^{cd}	0.076 ± 0.012^{d}	0.749 ± 0.045^{a}

* (% dry wt) Vertical means and standard deviations followed by different letters are significantly different at $p < 0.05$.

TABLE 2
DIFFERENCES AMONG BRANDS OF COFFEE IN CAFFEINE CONTENT* (% dry wt)

BRANDS	CAFFEINE (%)
Albertson's Special Roast	0.663 ± 0.014[b*]
Taster's Choice	2.127 ± 0.057[a]
Maxwell House Instant	2.231 ± 0.608[a]
MJB Colombian	1.077 ± 0[c]

* Vertical means and standard deviations followed by different letters are significantly different at $p < 0.05$

Medical Advisor in Buenos Aires, Argentina. Each of the products were sealed by the manufacturer. The seals were in place when they were received by Dr. Bruce Woolley of the Pharmacology Research Laboratory at Brigham Young University. A chain of custody was established in order to prevent any possibility of adulteration after receipt.

Sample preparation and HPLC analysis

Dried leaf and stem material (250 mg) were placed in a 50ml flask to which 75/25 ethanol/water were added. The sealed flask was shaken for 24 hr, then filtered with Whatman filter paper and placed into a 50ml volumetric flask filled to volume with 75/25 ethanol /water. For HPLC analysis (HP 1100 equipped with a diode array detector), 1.5 ml was filtered (Nylon Acrodis 13 filter, 0.45um, 13mm) and placed into a vial for HPLC analysis.

Methods generally followed Clifford and Ramirez-Martinez (1990) and Filip et al. 1999) with modification. A Luna II (5um, 250 x 4.6 mm, C_{18}) column was used for separation of chemicals. The mobile phases were: Pump A - 2% acetic acid; Pump B - 10g citric acid, 20 ml 1N NaOH and 200 ml acetonitrile in H_2O making to a total volume of 1 L. The injection volume was 20ul, the wavelength 274nm and the gradient program was run for 50min. Caffeine and theobromine standards were purchased from Sigma Chemicals, and calibration curves were determined (caffeine, $r^2 = 0.999$; theobromine, $r^2 = 0.998$). Concentrations are expressed as 5 dry weight of sample, and statistical differences are by one-way ANOVA.

RESULTS

Comparisons of caffeine and theobromine content of the different brands of Yerba maté are reported in Table 1. Examination of these eight brands of Yerba maté showed average levels of caffeine to be 0.84% (range: 0.64% and 1.17%) and an average theobromine content of 0.17% (range: 0.076% and 0.182%). Thus, total caffeine content for Yerba maté products examined in this study average 0.95% (range: 0.75% to 1.35%). This is consistent with previous data from studies of Yerba maté (Tenorio Sanz 1991; Alikaridis 1987).

Comparisons of caffeine contents in domestic coffees are reported in Table 2. Significant differences in caffeine content were found, with Taster's Choice and Maxwell House Instant having the highest caffeine level and Albertson's Special Roast the lowest. Taken together these domestic coffee products contained an average of 1.52% caffeine (range: 0.66% to 2.23%) compared to 0.95% for the Yerba maté group (Table 3). This is, on average, 0.57% greater than the caffeine levels in the maté group.

DISCUSSION

A broadly representative sample of Yerba maté products from South America contain about 2/3 the amount of caffeine, as a percent of dry weight, compared to a sample of domestic coffee products. There appears to be some variability in the amount of caffeine contained in both the maté and coffee products. This may be a product of variances within a particular lot of the product or may reflect differences in the caffeine content of individual coffee beans or Yerba maté leaves.

There are, however, many differences in content between Yerba maté and coffee that deserve mention. In addition to the stimulant properties that result from the caffeine content, the leaves of Yerba maté contain minerals, about 15 amino acids, and several saponins. Several studies have demonstrated that maté extract may have additional health benefits. In one study (Swantson-Flatt), the maté extract "retarded the development of hyperglycaemia" in diabetic mice and "reduced the hyperphagia, polydipsia, body weight loss, and glycated haemoglobin."

Some herbal researchers have hypothesized that the various nutrients in the extract of Yerba maté may help ward off free radicals and encourage healthy sleeping pat-

TABLE 3
DIFFERENCE AMONG BRANDS OF YERBA MATÉ AND COFFEE IN CAFFEINE CONTENT* (% dry wt)

SAMPLE	BRANDS	CAFFEINE (%)
Yerba Maté	Average (8 brands)	0.954 ± 0.049
Coffee	Average (4 brands)	1.525 ± 0.169

Reported as mean ± standard deviation. Differences are statistically significant at $p < 0.05$.

terns (Gugliucci, 1996). The antioxidant properties demonstrated clinically by Yerba maté were reported in three clinical studies demonstrating its high antioxidant values linked to rapid absorption of known antioxidant phytochemicals found in maté leaves (Schinella, 2000; Raintree Nutrition 2000). More recent clinical studies have suggested that certain saponins isolated in maté leaves may stimulate the immune system (Kraemer, 1996; Schenkel, 1996).

SUGGESTIONS FOR FUTURE STUDIES

In our study we made a comparison between the caffeine content of eight brands of Mate sold in Argentina and Paraguay and four commonly sold domestic brands of coffee. The comparisons included only caffeine and theobromine. However, there are many other pharmacologically active constituents attributed to Mate that were not included in the HPLC comparison. Future studies should be conducted that would include these other pharmacologically active components to determine concentration levels. Additional bioequivalence studies should also be conducted between different lots of the same product brands to evaluate inter-lot equivalence. Clinical trials may also be of benefit in evaluation of potential beneficial and adverse effects from use of this plant.

Bruce H. Woolley, PHARM.D., is a professor in the Department of Physiology and Developmental Biology, Brigham Young University.

Kenneth J. Hunt is a fourth-year medical student at the University of Utah College of Medicine.

Rex G. Cates, PH.D., is a professor in the Department of Integrative Biology and director of the Chemical Ecology Laboratory at Brigham Young University.

Jiping Zou, PH.D., is a full-time researcher in the Chemical Ecology Laboratory at Brigham Young University.

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AIDS
The Great Scourge?

By Robert K. Maddock, Jr., M.D.

"And in that generation shall the times of the Gentiles be fulfilled. And there shall be men standing in that generation, that shall not pass until they shall see an overwhelming scourge; for a desolating sickness shall cover the land. But my disciples shall stand in holy places, and shall not be moved; but among the wicked, men shall lift up their voices and curse God and die." *(D&C 45:30-32)*

Origins

THE HISTORY OF the human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS) is an evolving puzzle. Our best guess is that HIV lay undetected in a few isolated central African villages for 40 or more years. Its average 11-year incubation, during which the individual may have no symptoms, made it difficult to recognize. Retrospective analysis of stored blood samples from Africa collected between 1959 and 1982 has shown that the first known case was in a Bantu man living in Leopoldville, Belgian Congo in 1959.[1] Analysis of blood collected on other continents showed that the first American case was in a 15 year-old lad with Kaposi's sarcoma who died in 1969. The first European case was in a Danish surgeon who had worked in Zaire and died in 1976. Given the 11-year asymptomatic period, the Bantu man likely acquired his illness in the 1940s or 1950s. The theory that HIV causes AIDS is fully supported by Koch's Postulates. The prevailing hypothesis is that HIV may have come across species from the simian immunodeficiency virus (SIV). [2]

Initially two strains of HIV were described. HIV-1 describe in 1983 predominated throughout the world. A rare and less cytopathic disorder that multiplies more slowly, HIV-2, was found initially in West Africa in 1986.[3] The earliest positive HIV-2 blood sample came from Guinea Bissau in the 1960s.[3] Both HIV-1 and HIV-2 appear to derive from SIV variants. Only HIV-1 will be discussed in this paper and will be referred to as HIV.

Geneticists identified two groups of HIV: M or main group with 11 subtypes lettered A through K and the O group. The HIV found in the 1959 blood sample is in the trunk of the HIV genetic tree about the point where B and D branch off. HIV-1 is a benign disease in chimpanzees. Africans have hunted, butchered and eaten primates for centuries. This lends credence to the hypothesis that one virulent strain of the virus may have been passed from primates to humans sometime between 1924 and 1946.[4]

AIDS first came to the attention of clinicians and the epidemic intelligence service officer in Los Angeles in 1981. They reported five cases of *pneumocystis carinii* in young homosexual men in the *MMWR*. An editorial note suggested these cases represented a "cellular-immune dysfunction related to a common exposure" and a "disease acquired through sexual contact."[5] This led to a flurry of reports. Between June 1, 1981 and September 15, 1982, the Centers for Disease Control and Prevention in Atlanta (CDC) received reports of 593 cases of AIDS with 243 deaths in which the common risk factors were identified.[6] In 1983 two women partners of injection drug users were discovered to have AIDS.[7] In 1983 Luc Montagnier of the Pasteur Institute in France isolated the virus causing AIDS.[3]

HIV attacks a number of different cell types especially those associated with the development of immunity. Its course is followed by counting special lymphocytes, T4 helper cells. In time, the infected person loses his cell mediated immunity and antibody production capability and becomes subjected to a host of "opportunistic" bacterial and viral illnesses that cause the syndrome, AIDS. This occurs in most people who are infected by the virus.

A few people are resistant to HIV. They have a 32-bp inactivating deletion in the beta-chemokine receptor 5 (CCR5) gene that produces the R-5 receptors on macrophages. This gene is most prevalent (11.1%) in persons of Finno-Ugrian and western Siberian descent.[8] The further one goes from the eastern Baltic regions to the south and east, the less commonly this gene is found. Without these receptors, HIV cannot enter the macrophage. People who carry both defective R-5 genes are resistant to HIV infection. Heterozygous individuals may get HIV, but will be more resistant than those who have no gene defects. The disease also progresses more slowly in heterozygous individuals.[9] This gene defect protects against only HIV, subtype B, prevalent in the US and Europe. It does not protect against those strains prevalent in Africa. The defective R-5 gene is homozygous in 1% of whites of European descent and is heterozygous in 20% of the same population. The defect has not been found in people from Japan and Central Africa.[9]

Table I shows the distribution of the two principle genetic groupings and subgroups of HIV-1.[10] The O group is small and in some places represents less than 1% of all HIV infections.[11] The M group consists of 11 known subtypes or clades, A through K, and causes 99% of all known AIDS cases. The more common subgroups are in bold face.

TABLE I: DISTRIBUTION OF HIV-1

	SUBGROUPS OR CLADES	
Region	*1990*	*1998*
North America	**B**	A, **B**, D, E, O
South America	**B**, C, F	**B**, C, E, F
Europe	**B**	**B**
Eastern Europe	F, C, D, O	F, C, D, O
Eastern Mediterranean		I
Africa	**A**, B, **C**, **D**, E, G, H, O	**A,** B, **C**, **D**, E, F, G, H, J, O
Indian Sub-continent	A, B, **C**	A, B, **C**
South East Asia	**B**, C, E	**B**, C, E
Asia	B, **C**, **E**	B, **C**, **E**
Australia	**B**	**B**

Recent genetic studies of the HIV-1 strain show that different variants may be affecting homosexuals, intravenous drug users and heterosexuals in different proportions.[12,13,14] Genetic analysis of HIV may make it possible to trace global and local patterns in the spread of the virus.[15]

HIV/AIDS definition in the U.S.: a moving target

"For I know that cursed is he that putteth his trust in the arm of flesh." (2 Ne. 4: 34)

Data from the United States comes from the CDC, which reports actual case numbers of the syndrome, AIDS. The World Health Organization (WHO) does not have that ability. Many countries do not have reliable epidemiological information. The incidences reported by WHO are usually given to the nearest 100 to 100,000 based on the best guess available. In the case of Africa, some parts of Eastern Europe, and Asia cases may be underestimated. When WHO reports HIV/AIDS it means the total of those estimated to be infected with the virus plus those with the syndrome.

As the disease became better understood, the definition in the U.S. changed. Reports of AIDS in scientific literature began in 1981. Early in its history, AIDS had a

number of monikers. It was called GRID (Gay-Related Immune Deficiency). Luc Montangnier, who isolated it, called it LAV (lymphadenopathy-associated virus). It was called Gottlieb's disease for the physician who first described it. Finally it was called "HIV disease." The definition of the syndrome was modified in 1983 when AIDS became "reportable." In 1985 additional diseases were included in the definition; this lead to a 2% increase in what had previously been diagnosed as AIDS. During this time ARC (AIDS-Related Complex) was in use. By 1987 antibody tests were available and the disease was redefined. This lead to a 35% increase in reported cases. The CDC dropped the acronym ARC in their 1987 definition. In 1992, a year of political change, the Social Security Administration requested another redefinition for purposes of disability determination. The 1993 government definition abandoned the concept of a syndrome of opportunistic infections. AIDS now became a laboratory-defined illness in the United States that required only a T4 count of less than 200 and a positive HIV test. This led to a 52% increase in incidence of AIDS over that of 1987. As Stine states, "Such rapid changes alters the baseline from which future predictions are made and makes the interpretations of trends in incidence and characteristic of cases difficult to process."[16]

T4 Lymphocyte Counts & Viral Load

The concepts of "viral load" or the number of HIV RNA viral strands in blood and theT4 lymphocyte count are important. The disease first manifests itself as a flu-like illness. Initially the virus seeds the lymphocytic organs and the amount of HIV RNA rises rapidly in the blood. At this time the common HIV antibody tests will not detect the virus, but an HIV RNA viral load test will. Thus a person with high-risk behavior who develops a flu-like illness should undergo immediate viral load testing. The normal number of T4 cells (1000 to 1200 / mm^3) may drop only slightly during this time. Macrophages, monocytes, and follicular dendritic cells in the lymph nodes are infected early. The virus may also hide in many other organs of the body such as the testes (sperm cells) and milk glands. The body develops an HIV antibody that over a period of about 6-12 weeks drops the HIV RNA load in the blood. During this time circulating T4 cells drop to about ½ normal, but as the HIV RNA is reduced in the blood through the action of the HIV antibody, T4 cells may rise again to about ¾ normal levels. Slowly over time the HIV RNA load increases while the T4 cells decrease. When T4 cells reach a critical low of about 200 / mm^3, opportunistic infections begin to ravage the person and death follows within a year or so.[17] Towards the end of life, the follicular dendritic network of the lymph nodes is dissolved and large numbers of virus are released into circulation.[18]

The viral load is a direct reflection of ongoing HIV replication.[19] In general the higher the circulating HIV RNA in plasma, the more rapidly the disease is likely to progress, the shorter the life expectancy,[20] and the greater that person's infectivity.[21] It does not appear to correlate with the dementia seen in the AIDS dementia complex that develops during the symptomatic phase in 55% to 65% of patients. HIV does not infect brain cells, but resides in brain spaces in cerebral spinal fluid.[21]

High viral loads at the onset of the disease and at 3 years after infection with HIV are associated with disease progression.[22] In 1996 a mathematical model of persons with HIV found that people with a viral load of 10^5 (100,000 copies) will progress to AIDS in about three years while a person with 500,000 copies will likely progress to AIDS in 1 year. Those with only 10^4 (10,000 copies) may have 19 years before progression to AIDS. It is important to remember that only about 2% of the HIV RNA is in the blood. The other 98% is in the lymphatic tissue and elsewhere. In general, the lower the viral load the less active the disease is and the longer the predicted longevity. Current tests will measure between 50 and 400 copies per ml. The lack of HIV RNA in the blood does not equate to a cure.[23] The objective of drug treatment is to get the HIV RNA as low as possible. Drug failure occurs when the viral load increases.

Behavior and Risks of HIV/AIDS

> *"And behold, according to the words of the prophet, the Messiah will set himself again the second time to recover them; wherefore, he will manifest himself unto them in power and great glory, unto the destruction of their enemies, when that day cometh when they shall believe in him; and none will he destroy that believe in him. And they that believe not in him shall be destroyed, both by fire and by tempest, and by earthquakes, and by blood sheds, and by pestilence, and by famine." (2 Ne. 6:14-15)*

HIV is a pernicious killer. While the infected individual unwittingly spreads the disease for a decade or more, the person is oblivious to its presence. When the damage has been done, it tortures then kills its victim as though its host were needed no more. While it works its destruction, it "changes itself faster than a rumor making the gossip column of a tabloid."[24] On average the asymptomatic phase lasts 11 years before AIDS begins. It is transmitted primarily by sexual activity and affects adults during their most productive years (ages 15 to 45). Thus it has

TABLE II: RISKS OF INFECTION

Transfusion of screened blood	1/450,000-650,000 transfusions
Uninfected man	1/9000 acts of vaginal intercourse
Uninfected woman	1/1000 acts of vaginal intercourse
Accidental Needle stick	3/1000
Uninfected man or woman	5-10/1000 acts of anal intercourse
Intravenous drug use	10-20/1000 acts
Sexual contact with STD (non-ulcerative)	Multiply above risk x 3-4
Sexual contact with STD (ulcerative)	Multiply above risk x 10-20
Acupuncture, artificial insemination, needle injections in developing countries, tattoo, transplantation of infected organs, and deep human bites	Known risk

the potential of decimating society's most productive individuals.

Our response to syphilis, a far less dangerous illness, between World War I and II is similar to our current response to AIDS — massive public education about high-risk sexual behavior, condom protection, and serological testing. The results of such effort are likely to be the same as for syphilis — not much.[25] It was only when penicillin became available in large quantities that syphilis was controlled.

There is no difference between the clinical course of AIDS/HIV in men and women.[26] The chances of infection are low, but the stakes are high. The low infectivity rate and the belief that a "cure" will come to their rescue, lulls many into a false sense of security.[27] The relative risks of infection have been determined through a number of epidemiological studies.[28]

It must be emphasized that these figures are from epidemiological studies and *cannot be used as a guide to individual behavior*. Studies have shown that infectivity can vary within an individual depending on the stage of HIV/AIDS. It can be high at the very beginning of the disease and several years later. It can also be affected by any illness that causes a break in mucosal surfaces such as found in sexually transmitted diseases (STD).

The *most important risk factor* is a history of any STD.[28] The U.S. has the highest rate of STDs of any developed country.[27] There are about 15 million new cases each per year.[29] By age 21 one out of five people has received treatment for a sexually transmitted disease.[29] Some 22% of people over age 15 have the herpes virus, but only about 20% of those know that they have it.[30] The presence of an active STD, especially those that cause ulcerations of the mucosal surfaces (Herpes, Syphilis, Chancroid) increases the likelihood of transmission of the disease by 10- to 20-fold.[31] If there is gonorrhea or Chlamydia the risk is increased by 3 to 4 times.[31] There are more than 50 organisms and syndromes transmitted as a result of sexual activity. This includes hepatitis C. It is now estimated that by the 12th grade 70% have had sexual intercourse[32] and 50% have two or more partners.[33]

The last year for which the CDC reported various sexually transmitted diseases was 1998. In that year there were 607,602 cases of Chlamydia (236.6/100,000 population), 355,642 of gonorrhea (132.9/10^5), 6993 of syphilis (2.6/10^5). Other sexually transmitted diseases are not reported uniformly in the U.S. These include chancroid, non-gonococcal urethritis, genital herpes simplex virus (HSV-2), human papillomavirus (genital warts, which lead to cervical dysplasia and cancer of the cervix), and trichomoniasis.[34]

Prevention

> *"I, the Lord, am bound when ye do what I say; but when ye do not what I say, ye have no promise." (D&C 82:10)*

Apart from avoiding intravenous drug use, abstinence before marriage and sexual activity only inside marriage there is no known way to prevent HIV/AIDS with any degree of certainty. Most countries reject quarantine as being impractical, against human rights, and too expensive. Most current methods rely on education, counseling, "sex worker" and voluntary testing, partner notification, drug abuse treatment, "barrier" (condom) promotion and needle exchanges.

Do restrictive "needle-syringe laws" work? The answer is not in the U.S. According to the St. Louis University School of Public Health, those states with no restrictions to the obtaining of needles, "no law," the HIV transmission rate was 0.83 per 100,000. In those with laws making it a felony to have a needle / syringe, the rate was 1.63 per 100,000. In those states having laws prohibiting the obtaining of needles without prescription and laws against owning paraphernalia, the rate was 5.78 per 100,000.[35]

Do condoms work? This is a complex question. Some work better than others when used properly. Even then they do not provide complete protection. An analysis of 11 studies in 1993 indicated that condoms were only 69% (range 46% to 82%) effective in preventing HIV transmission.[36] Condoms prevent pregnancy about 90% of the time. Other studies have shown that "correct use" increases effectiveness. Do they work in adolescence? The answer is that most adolescents refuse to use them.[37] Studies in the U.S. and Switzerland do not indicate that there is increased sexual activity among adolescents when condoms are generally available.[38] Do they work in Africa? The answer according to WHO data would indicate that they have little effect.[39] When you have intercourse with someone, you have just had intercourse with everyone with whom that person has had intercourse in the past ten years.

Testing

> *"All their glories, laws, and set times, shall be revealed in the days of the dispensation of the fullness of times." (D&C 121:31)*

Who should have antibody testing for HIV? The answer is all those with high-risk behaviors. These are: any anal sex, injection drug use, frequent casual heterosexual activity, encounters with prostitutes, previous treatment for any sexually transmitted disease (genital warts, herpes, gonorrhea, syphilis and Chlamydia), blood transfusion before 1985-87, sexual activity with a person with any risk factors, and infants born to women with any risk factors.[40] It must be emphasized that a flu-like illness occurring in a person with risk factors should prompt immediate RNA viral load testing.

If a person presents with unexplained fever, night sweats, severe fatigue, weight loss, recent infections with thrush or shingles, HIV should be suspected. If the physical examination shows weight loss, enlarged lymph nodes and/or tonsilar enlargement, candidiasis, hairy leukoplakia, skin lesions such as Kaposi's sarcoma, varicella-zoster, or psoriasis, hepatosplenomegaly, changes in the mental status examination, HIV / AIDS must be considered.[41] It is important for travelers to know that 61 foreign countries now require an HIV test before entry into their country. A list of these countries can be obtained at the Bureau of Consular Affairs website at http://travel.state.gov/foreignentryreqs.html.

Treatment

> *"He informed me of great judgments which were coming upon the earth, with great desolations by famine, sword, and pestilence; and that these grievous judgments would come on the earth in this generation. (JS-H1: 45)*

When to treat patients is still debated. Federal guidelines recommend no treatment when the T4 count is 500 or more and the viral load is below 20,000. Treatment is expensive. Absolute compliance is necessary. Not all people respond.[42] Treatment of 5 years or more is associated with increased incidences of diabetes, cholesterol-associated heart disease, liver diseases and many cancers.[43] Even more ominous, some are dying despite low viral load counts and acceptable T4 counts.[44] Despite its expense highly active antiretroviral medicines, properly taken and supervised, reduced the total cost of AIDS treatment in the U.S. Between 1996 and 1997 the mean expenditure per patient (including hospital costs) dropped from $1,792 per patient per month to $1,359.[45]

The good news is that with medical care, the death rate of AIDS began to drop in the US, Canada, France, Germany and Switzerland in 1994 and continued through 1998. This may be due to antiviral therapy. The bad news is that recent reports indicate upwards of 50% of people are now experiencing drug failures.[46] The bottom line is that we do not know how long our current drug regimens will work.

During the average 11-year asymptomatic period the virus undergoes between 3,000 and 5,000 replication cycles or generations and produces over $10^{13\text{-}14}$ (1 to 10 trillion) viruses. The estimated mutation rate is 1 per 10, 000 nucleotides and one mutation caused by reverse transcriptase copy error per round of replication. This creates many opportunities for mutation. It is thought that this overwhelms the HIV infected person's immune system. It makes a difficult task for pharmaceutical and vaccine manufacturers.[18,47]

HIV kills by eventually lowering the person's resistance to opportunistic infections. As the circulating T4 cell count drops to 500, bacterial skin infections, shingles, oral thrush and severe athletes foot begin to occur. As the count drops to 200 or less the following begin to appear: oral hairy leukoplakia, pneumocystis carinii pneumonia, histoplasmosis disseminata, coccidioidomycosis disseminata, cryptococcal meningitis, Toxoplasmosis (brain), herpes simplex infections of the skin, mucous membranes and esophagus, cryptosporidium infection of the intestines, cytomegalovirus infections of the retina, esophagus, and colon, mycobacteria avium complex infections. Latent tuberculosis becomes active at the rate of about 10% per year instead of 5% within the first two years and 5% for the rest of the person's life.[48] These opportunistic infections kill most of the patients with AIDS. In countries where HIV/AIDS has become common, tuberculosis has become a serious public health menace and spreads to those unaffected by HIV/AIDS. A recent report indicates that resistance to P*lasmodium falciparum* malaria drops as the T4 count falls.[49] Coinfections with HIV, hepatitis A and B viruses may influence the fibrotic progression of persons with Hepatitis C.[50] It is of some interest that in ancient Israel, where postmortem examinations were practiced by physicians,[51] the association between harlots and liver disease may have been noted.[52]

Incidence

> *"I will prophesy that the signs of the coming of the Son of Man are already commenced. One pestilence will desolate after another." (Teachings of the Prophet Joseph Smith, compiled by Joseph Fielding Smith.)*

TABLE III: CDC'S RANKING OF STATES BY INCIDENCE OF AIDS IN THE TOTAL POPULATION

BELOW AVERAGE STATES		ABOVE AVERAGE STATES		NORTH AMERICA	
States	*Incidence*	*States*	*Incidence*	*Country*	*Incidence*
ND, SD	0.01%	LA, TX	0.12%	Canada	0.16%
MT, ID, WY, IA, KY	0.02%	GA	0.13%	U.S.	0.11%
AK, VT, NE, MN, WI	0.03%	CA	0.14%	Mexico.	0.29%
UT, ME, NH, IN, OH, OK, KS	0.04%	DE	0.15%		
NM, MI	0.05%	CT, NJ	0.18%		
WA, OR, AR, NC	0.06%	MD	0.19%		
AZ, CO, AL, MS	0.07%	FL	0.23%		
MO, IL, TN, HI, VA	0.08%	NY	0.30%		
RI	0.09%	DC	1.18%		
PA	0.10%				
NV, MA, SC	0.11%				

North & South America: WHO and CDC Data Compared

The Centers for Disease Control and Prevention, Atlanta Georgia, keeps a precise count of AIDS in the U.S and publishes their data online.[53] When statistics are quoted about HIV/AIDS, it is important to understand what is being reported — HIV, AIDS or both. CDC data compiled for the year 1999 and reported as of September 2000 showed that the U.S. had 2,817 persons less than 13 years of age and 305,388 persons 13 years of age and older living with AIDS.[53] The burden of AIDS in the U.S is 308,205. The total population of the US for the same period was 272,878,000. The average incidence of reported AIDS is 0.11%. Keep in mind that the definition of AIDS in the U.S. is now based solely on laboratory testing (T4 count of less than 200 and a positive HIV test).[15]

According to the World Health Organization data published online in their *Epidemiological Fact Sheet on HIV/AIDS and sexually transmitted infections, 2000 Update*, this statement precedes all data: "In 1999 and during the first quarter of 2000, UNAIDS and WHO worked closely with national governments and research institutions to recalculate current estimates on people living with HIV/AIDS. These calculations are based on the previously published estimates for 1997 and recent trends in HIV/AIDS surveillance in various populations. A methodology developed in collaboration with an international group of experts was used to calculate the new estimates on prevalence and incidence of HIV and AIDS deaths, as well as the number of children infected through mother-to-child transmission of HIV. Different approaches were used to estimate HIV prevalence in countries with low-level, concentrated or generalized epidemics. The current estimates do not claim to be an exact count of infections. Rather, they use a methodology that has thus far proved accurate in producing estimates that give a good indication of the magnitude of the epidemic in individual countries. However, these estimates are constantly being revised as countries improve their surveillance systems and collect more information."[54] It is important to keep this definition in mind when reviewing UNAIDS/WHO data. A comparison between CDC and WHO data is not possible.

When the U.S. changed its definition of AIDS the syndrome to laboratory findings, the number of AIDS cases increased by 52%.[55] In 1992 the CDC estimated that there were between 650,000 and 900,000 people with HIV in the U.S.[53] According to these estimates, the incidence of HIV in the U.S. would be between 0.22% and 0.33%. WHO data are reported as "Estimated number of adults and children living with HIV/AIDS, end of 1999." This and an "Adult rate" are found on page 3 for each country reporting.[54] Population data are found on page 2 for each country.[56]

HIV/AIDS in Canada is 0.16% as reported by UNAIDS/WHO. Canada reports that as of December 31, 1999 she had a cumulative total of 45,534 positive HIV tests of which 13% were women, but that of the new cases in the past year, 24.3% were women. There was also a corresponding rise in HIV reports among heterosexuals. As of the end of 1999 there were a cumulative total of 16,913 AIDS cases.[57] Mexico reports an incidence of 0.29% to UNAIDS/WHO.

An added complication to such comparisons is that many believe UNAIDS/WHO underestimates the true

TABLE IV: AIDS AS A CAUSE OF DEATH IN THE U.S.

Leading Cause	Black & Hispanic men ages 25 to 44
2nd	Black women ages 25 to 44
4th	All women ages 25 to 44
5th	All Persons ages 25 to 44
7th	All Children ages 1 to 14
14th	Overall

picture. To complicate matters, when simple mathematical calculations are applied to UNAIDS/WHO numbers, an estimated incidence based on population data does not compute. All data quoted from UNAIDS/WHO are as stated in their online reports. No efforts have been made to recompute or reconcile them.[54]

States in the U.S. along the eastern seaboard and the Gulf of Mexico have the greatest numbers of people with AIDS. HIV/AIDS in the U.S. is rapidly becoming a disease of minorities. In the year 2000 32% of new cases were in Whites, 46% were in Blacks and 19% were in Hispanics. The numbers of women were also increasing: 77% men, 23% women.[58] As of 2001 the incidence of AIDS was six times higher in blacks and three times higher in Latinos than among whites.[59]

The CDC has tracked special populations. In the U.S the incidence among prisoners is 2.6%,[60] Job Corps entrants 0.33%, 58 college students 0.2%,[61] and military recruits 0.15%[62] (Navy – 0.25%, Army – 0.14%, Marines – 0.10%, Air Force 0.10%). Since 1988, 40,000 people per year have acquired HIV in the U.S.

The CDC found that between 1986 and 1987, 20% of homosexual men and 5% of bisexual men with infrequent homosexual encounters were HIV positive.[63] There are no good data estimating the total number of homosexuals and bisexuals in the U.S. Estimates range from 10% (1948 Kinsey report) to 2.8% (National Opinion Research Center 1992), and 1% (Judith Reisman, Kinsey, Sex and Fraud 1990).[63] The CDC data show that 48% of AIDS cases in white Americans, 42% in black Americans, and 46% in Latino Americans result from homosexual contract. At the end of 1998, of the 297,000 with AIDS in America, 39% were white, 40% were black, and 20% were Hispanic. AIDS is now killing more black Americans under age 55 than heart disease, cancer, or homicide.[64]

According to the CDC, as many as 33% of injection drug users (IDU) may be HIV-infected. Some 52% of the IDU-only AIDS cases occurred in New York and New Jersey. Over half of the heterosexual cases of AIDS had partners who were IDU.[64] Worldwide, the figures are quite different. Heterosexuals make up 75% of the estimated 40 million people with HIV. About 70% of these live in Sub-Saharan Africa.[65]

As of 2001 the CDC indicated that 10% of the AIDS cases occurred through heterosexual contact. Most of these cases occurred when the partner had an identifiable behavioral risk. Starting in 1996 only 5% of the new AIDS cases each year were among heterosexuals.[63]

Between 1981 and 1995 in the U.S. 340,926 persons died of AIDS. In 1995 alone, 49,351 died. AIDS accounted for 1.8% of all deaths. Since then there has been a steady decline in deaths, probably due to treatments that may be only postponing death. There were 36,794 deaths in 1996, 21,222 in 1997, 17,847 in 1998, 14,272 in 1999 and 12,000 in 2000.[66] According to former Surgeon General C. Everett Koop, the disease is "virtually 100% fatal."[67] Corroborating those figures, 95% of those diagnosed with AIDS in 1981 are now dead and 60% with AIDS diagnosed up through 1998 are dead.[67] Of those deaths, 59% have been homosexual and bisexual men, and 21% have been in injection drug users.[68] Groups that have suffered most are noted in Table IV.[66,67] According to the CDC AIDS deaths are underreported by 10% to 15%.[68]

The Caribbean

In the Americas the hot spot for HIV/AIDS is the Caribbean, according to UNAIDS/WHO data.[54]

As will be discussed later, Tuberculosis (TB) commonly accompanies HIV/AIDS. In the Caribbean the TB rates are measured in the double digits. In the U.S. in 2000 there were 16,377 cases reported to the CDC; the incidence was 5.8 cases per 100,000.[48] According to 1998 incidence reports for all types of TB, the countries in the Caribbean with the most TB are: Haiti (9,857 cases 123.9/100,000 population), Honduras (4,960 and 80.0/105), Nicaragua (2,604 and 54.2/105), Panama (1,479 and 53.9/105), and Dominican Republic (4,263 and 51.8/105).[69]

In South America the highest incidence of AIDS according to WHO data is along the east coast.[53] Columbia 0.31%, Venezuela 0.49%, Suriname 1.26, Guyana 3.01%, Brazil 0.57%, Argentina 0.69%, Ecuador 0.29%, Peru 0.35%, Chile, 0.19%, Bolivia, 0.10%, Paraguay

TABLE V: WHO DATA ON HIV/AIDS IN THE CARIBBEAN

Country	*Rate*	*# Cases*
Guatemala	1.38%	73,000
Belize	2.01%	2,400
Honduras	1.92%	63,000
Nicaragua	0.20%	4,900
Costa Rica	0.54%	12,000
Panama	1.54%	24,000
Columbia	0.31%	71,000
Venezuela	0.49%	62,000
Guyana	3.01%	15,000
Suriname	1.26%	3,000
Trinidad	1.05%	7,800
Barbados	1.17%	1,800
US Virgin Is*	0.19%	205
Puerto Rico*	0.28%	9,216
Dom Repub	2.80%	130,000
Haiti	5.17%	210,000

* CDC data.

TABLE VI: WHO HIV/AIDS 2000 UPDATE FOR EUROPE[53]

SOUTHERN EUROPE

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Portugal	9,873,000	36,000	0.74%
Spain	20,779,000	120,000	0.58%
France	58,886,000	130,000	0.43%
Switzerland	7,344,000	17,000	0.46%
Italy	57,343,000	95,000	0.35%
Malta	386,000	220	0.12%
Austria	8,177,000	9,000	0.23%
Hungary	10,076,000	2,500	0.05%
Croatia	4,477,000	350	0.02%
Bosnia / Herzegovina	3,839,000	750	0.04%
Slovenia	1,989,000	200	0.02%
Yugoslavia	10,637,000	5000	0.10%
Romania	22,402,000	7000	0.02%
Rep. Of Moldova	4,380,000	4500	0.20%
Bulgaria	8,279,000	300	0.01%
Greece	10,626,000	8000	0.16%
Albania	3,113,000	<100	<0.01%
Macedonia	2,011,000	<100	<0.01%

MID-EUROPE

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Ireland	3,705,000	2200	0.10%
United Kingdom	58,744,000	31,000	0.11%
Belgium	10,162,000	7700	0.15%
Netherlands	15,735,000	15,000	0.19%
Luxembourg	426,000	330	0.16%
Czech Republic	10,262,000	2200	0.04%
Slovakia	5,382,000	400	< 0.005%
Ukraine	50,658,000	240,000	0.96%

NORTHERN EUROPE

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Germany	82,178,000	37,000	0.10 %
Poland	38,740,000	13,000	0.06%
Lithuania	3,682,000	<500	0.02%
Latvia	2,389,000	1250	0.01%
Estonia	1,412,000	<500	0.04%
Belarus	10,274,000	14,000	0.28%
Russian Federation	147,196,000	130,000	0.18%
Iceland	279,000	200	0.14%
Denmark	5,282,000	4300	0.17%
Norway	4,442,000	1600	0.07%
Sweden	8,892,000	3000	0.08%
Finland	5,165,000	1100	0.05%

0.11%, and Uruguay 0.33%. The countries with the highest rates of TB in South America for the year 1998 are: Peru (42,723 cases or 176.3/100,000 population), Bolivia (10,132 or 127.3/105), and Ecuador 9,184 or 75.4/105).[69] All others have rates less than 55/105. Uruguay has the lowest rate with 668 cases and a rate of 20.3/105.

Europe

According to the WHO 2000 update data for Europe, the incidence of HIV/AIDS tends to be more in the west and south.[53] Portugal (0.74%), Spain (0.58%), Switzerland (0.46%), France (0.43%), and Italy (0.35%) are the five countries in Western Europe reporting the most. The states reporting the least are Slovakia (<0.005%), Albania and Macedonia (<0.01%), Bulgaria and Latvia (0.01%), and Slovenia, Croatia, Romania, Lithuania with (0.02%) each.

The eastern bloc countries, carved out of the old Soviet Union report the most HIV/AIDS: Ukraine (0.96%), Belarus (0.28%), Republic of Moldova (0.20%), and the Russian Federation (0.18%). The other eastern block countries report fewer cases: The Baltic States (Estonia, Latvia and Lithuania), Poland, Hungary, Romania, Bulgaria, the Czech Republic and Slovakia report 0.06% or less.

The Middle East

Islamic countries report the lowest number of HIV/AIDS cases in the world despite the pandemic that rages about them.[53]

TABLEVII: WHO HIV/AIDS 2000 UPDATE FOR THE MIDDLE EAST[53]

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Turkey	65,546,000	2500	0.01%
Armenia	3,796,000	<500	0.01%
Cyprus	778,000	400	0.10%
Syrian Arab Rep.	15,725,000	800	0.01%
Lebanon	3,236,000	1500	0.09%
Israel	6,101,000	2400	0.08%
Jordan	6,482,000	660	0.02%
Saudi Arabia	20,899,000	1100	0.01%
Iraq	22,450,000	300	<0.01%
Kuwait	1,897,000	1300	0.12%
Iran	66,796,000	1000	<0.01%
Oman	2,460,000	1200	011%
Yemen	17,488,000	900	0.01%
United Arab Emirates	2,398,000	No report	No report
Qatar	589,000	300	0.09%
Bahrain	606,000	500	0.15%

Asia

The Islamic countries of Central Asia have less HIV/AIDS reported than any other major area of the world.[53]

The Islamic countries of Pakistan, Bangladesh and Indonesia report low numbers of AIDS cases while India and other parts of Southeast Asia constitute one of the world's hot spots. Officially India carries the second highest burden of AIDS in the world and it may be raging out of control there. UNAIDS believes that there may be as many as 7 to 8 million infected.[70] This would make India the country with the most cases. China reports 500,000 cases,[53] but then states they have 700,000 AIDS patients among injection drug users.[28] Both have also reported spread of HIV through infected blood supplies in the 1990s.[71] Most developing countries suffer from unreliable and erratic electric power sources. This exacerbates the problems for the few reliable laboratories and blood banking facilities that exist. Sterilization of surgical instruments and refrigeration of biologicals are variable. Reuse of IV tubing, surgical gloves, and needles are common. Spread of infectious diseases inside hospitals is frequent.

Africa

The situation in Africa is desperate. AIDS in south and east Africa is out of control with significant percentages of entire populations suffering from HIV/AIDS. The only bright spots are the Islamic countries in North Africa. These report very low rates of HIV/AIDS.

Below these countries are states that are partly Islamic, but have other religious influences: tribal paganism and Christianity. They are in primarily desert regions and are listed from West to East. As will be noted, the further to the East in Africa, and the further South they extend, the higher the numbers of HIV/AIDS cases.

Central Africa lies within 10 degrees of the Equator. The land is more tropical. Here religions are more evenly distributed and the number of HIV/AIDS cases rise dramatically. African countries are arranged in the table from West to East. Again, the further east in Africa, the higher the rate of HIV/AIDS tends. A recent report indicates that this may correlate with the higher incidence of genital ulcers found in the eastern African countries.[72]

The southern African states, especially those on the east coast are most severely affected. South Africa is classed as a Christian nation. The others are a mixture of tribal paganism and Christianity. Countries are listed from east to west across southern Africa.

The lowest tier of African states is also listed from east to west. Swaziland and Lesotho are countries that are landlocked within the South African borders. The rates reported are estimates. A recent study of patients admitted to two major city hospitals in Harare, Zimbabwe showed that of 196 patients, 58% were HIV positive. All were "infectious

TABLE VIII: WHO HIV/AIDS 2000 UPDATE FOR ASIA[53]

CENTRAL ASIA

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Kazakhstan	16,269,000	3500	0.04%
Georgia	5,006,000	<500	<0.01%
Azerbaijan	7,697,000	<500	<0.01%
Turkmenistan	4,384,000	<100	0.01%
Uzbekistan	23,942,000	<100	<0.01%
Kyrgyzstan	4,669,000	<100	<0.01%
Tajikistan	6,104,000	<100	<0.01%
Afghanistan	21,923,000	<100	<0.01%

SOUTHERN ASIA

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Pakistan	152,331,000	74,000	0.10%
India	998,056,000	3,700,000	0.70%
Sri Lanka	18,639,000	7500	0.07%
Maldives	278,000	<100	0.05%
Bhutan	2,064,000	<100	<0.01%
Nepal	23,385,000	34,000	0.29%
Bangladesh	126,947,000	13,000	0.02%
Myanmar (Burma)	45,059,000	530,000	1.99%
Thailand	60,856,000	755,000	2.15%
Brunei Darussalam	322,000	<100	0.20%
Cambodia	10,945,000	220,000	4.04%
Lao People's Dem Rep.	5,297,000	1400	0.05%
Viet Nam	78,705,000	100,000	0.24%
Singapore	3,522,000	3000	0.13%
Malaysia	21,830,00	49,000	0.42%
Indonesia	209,255,000	52,000	0.05%
Philippines	74,454,000	28,000	0.07%

ASIA (CONTINENTAL)

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
China	1,266,838,000	500,000	0.07%
Hong Kong	6,801,000	2500	0.06%
Mongolia	2,621,000	<100	<0.01%
Japan	126,505,000	10,000	0.02%
Korea	46,480,000	3800	0.01%

PACIFIC

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Australia	18,705,000	14,000	0.15%
New Zealand	3,828,000	1200	0.06%
Fiji	806,000	300	0.07%
Papua New Guinea	4,702,000	5400	0.22%

TABLE IX: WHO HIV/AIDS 2000 UPDATE FOR AFRICA [53]

NORTHERN AFRICA (ISLAMIC COUNTRIES)

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Morocco	27,867,000	5000	0.03%
Algeria	30,774,000	11,000	0.07%
Tunisia	9,460,000	2200	0.04%
Libya	5,471,000	1400	0.05%
Egypt	67,226,000	8100	0.02%

AFRICAN DESERT REGIONS

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Mauritania	2,598,000	6600	0.52%
Mali	10,960,000	100,000	2.03%
Niger	10,400,000	64,000	1.35%
Chad	7,458,000	92,000	2.69%
Sudan	28,883,000	140,000	0.99%
Eritrea	3,719,000	49,000	2.87%
Djibouti	629,000	37,000	11.75%
Ethiopia	61,095,000	3,000,000	10.63%
Somalia	9,672,000	No report	No report

13 PTCENTRAL AFRICA

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Senegal	9,240,000	79,000	1.77%
Gambia	1,268,000	13,000	1.95%
Guinea- Bissau	1,187,000	14,000	2.50%
Guinea	7,360,000	55,000	1.54%
Sierra Leone	4,717,000	68,000	2.99%
Liberia	2,930,000	39,000	2.80%
Ivory Coast	14,526,000	760,000	10.76%
Burkina Faso	11,616,000	350,000	6.44%
Ghana	19,678,000	340,000	3.60%
Togo	4,512,000	130,000	5.98%
Benin	5,937,000	70,000	2.45%
Nigeria	106,945,000	2,700,000	5.06%
Cameroon	14,693,000	540,000	7.73%
Equatorial Guinea	442,000	1100	0.51%
Gabon	1,197,000	23,000	4.16%
Congo	2,864,000	86,000	6.43%
Central African Rep.	3,550,000	240,000	13.84%
Dem. Rep. Congo / Zaire	50,335,000	1,100,000	5.07%
Uganda	21,143,000	820,000	8.30%
Rwanda	7,235,000	400,000	11.21%
Burundi	6,565,000	360,000	11.32%
Kenya	29,549,000	2,100,000	13.95%

13 PTISLANDS OFF THE EAST COAST OF AFRICA

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Comoros	676,000	400	0.12%
Madagascar	15,497,000	11,000	0.15%
Mauritius	1,150,000	500	0.08%

UPPER SOUTHERN AFRICA

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Angola	12,479,000	160,000	2.78%
Zambia	8,976,000	870,000	19.95%
Malawi	10,640,000	800,000	15.96%
Tanzania	32,793,000	1,300,000	8.09%

SOUTHERN AFRICA

Country	*Total Population*	*AIDS/HIV*	*Adult Rate*
Namibia	1,695,000	160,000	19.54%
Botswana	1,597,000	290,000	35.80%
Zimbabwe	11,529,000	1,500,000	25.06%
Mozambique	19,286,000	1,200,000	13.22%
South Africa	39,900,000	4,200,000	19.94%
Swaziland	980,000	130,000	25.25%
Lesotho	2,108,000	240,000	23.57%

disease" patients. The group also included those who were young and had weight loss. Those with non-infectious diseases did not have HIV.[73] Thus far there have been no major surveys of HIV in any African country.

The islands off the coast of Africa are apparently isolated from the pandemic on the continent of Africa.

Tuberculosis

> *"The Lord shall make the pestilence cleave unto thee, until he have consumed thee from off the land, whither thou goest to possess it. The Lord shall smite thee with a consumption, and with a fever, and with an inflammation, and with an extreme burning, and with the sword, and with blasting, and with mildew; and they shall pursue thee until thou perish." (Deut 28:21-22).*

Tuberculosis is one of the oldest diseases known to mankind. Only about 5% of people who are infected with Mycobacteria tuberculosis (TB) develop active disease. The other 95% successfully defeat and wall it off. These have positive skin tests and are termed to have "latent TB." About 10% of healthy people with latent TB will become ill with active tuberculosis some time in their life.[48] If, for any reason, a person with latent TB becomes immune suppressed (corticosteroids therapy, transplantation, chemotherapy, HIV), the TB may become active. Consequently there is a high association between active TB in any given population and the number of HIV/AIDS cases. Those with latent TB who get HIV become ill with TB at the rate of 10% per year.[74] "HIV is now the single most important risk factor in the expression of active TB;

TABLE X: TUBERCULOSIS IN AFRICA

Rate by Burden	*Country*		*No. of Cases*	*Incidence Rate / 100,000*	*Rank by Rate / 10^5*
# 6	Nigeria	(5.06%)	253,309	214	#14
# 8	So. Africa	(19.94%)	169,877	392	# 3
#10	Ethiopia	(10.63%)	156,384	260	# 4
#12	Dem Rep Congo	(5.03%)	129,227	269	#10
#14	Tanzania	(8.09%)	97,041	308	# 7
#15	Kenya	(13.95%)	84,389	297	# 8
#19	Uganda	(8.30%)	66,531	320	# 5
#21	Zimbabwe	(25.06%)	62,849	538	# 2

35% have it."[74] TB is the leading cause of death in HIV infected people. One-third die of it. Spread of TB to those without HIV has become a major problem in many parts of the world. A study by Dye and colleagues published in 1999 gives extensive data on worldwide tuberculosis.[75] As a point of reference, in 2000 the U.S. had 16,377 cases of TB and an incidence of 5.8 cases per 100,000.[48]

The five countries with the greatest number of cases or "burden" are India (1,795,532 cases), China (1,405,423), Indonesia (582,320), Bangladesh (300,152) and Pakistan (260,334). Other countries in the top 22 outside of Africa are: Philippines (7th), Russian Federation (9th), Vietnam (11th), Brazil (13th), Thailand (16th), Myanmar [Burma] (17th), Afghanistan (18th), Peru (20th), and Cambodia (22th).[75] Of the top 22 countries, 8 are in Africa, and these rank in the top 14 according to the rate of TB per 100,000 population. The percent of the population with AIDS is noted in the table after each country's name.

Closer to home, according to WHO, the Island of Hispaniola (Haiti and the Dominican Republic) has a total of 340,000 HIV/AIDS cases, and 37,701 cases of tuberculosis.

In most developed countries, treatment for TB must be directly observed. If medicines are taken improperly or sporadically, resistant strains develop and an expensive 4-drug regimen is required. There is indication that this already taking place in Latin America (see Table XI).[76]

Multidrug-resistance has become a serious problem in some of the eastern European countries (Estonia, Latvia, parts of Russia), parts of China and Iran.[77]

AIDS As a Scourge

> *"For nation shall rise against nation, and kingdom against kingdom and there shall be famines, and pestilences, and earthquakes, in divers places. All these are the beginning of sorrows." (Matt 24:7-8)*

As scourges go AIDS is an impressive killer. From 1981 to 2001 it killed an estimated 20 million people and continues at the current rate of 2.6 million per year. However, it has a way to go before it can be called a great worldwide scourge. According to WHO and the Harvard School of Public Health the plague (*Yersinia pestis*) or "the black death" killed a total of 7.1 billion between 542 and 1894 AD.[78] Smallpox is estimated to have killed in the hundreds of millions from 1122 until the 1970s. Various pneumonias currently kill 4.4 million per year. Between 1918-19 influenza killed 21.6 million in the US and Europe. Some of the worst of human killers are the viral

TABLE XI: PRIMARY RESISTANCE TO ANTI-TUBERCULOSIS DRUGS IN LATIN AMERICA

National Surveys Conducted From 1994 to 1997 WHO Data[76]

Country	*INH %*	*Rifampin %*	*Strep %*	*Ethambutol%*	*PR%*	*MDR%*
Argentina	7.8	5.1	7.6	3.1	12.5	4.6
Bolivia	10.2	6.0	9.8	5.0	23.9	1.2
Brazil	5.9	1.1	3.6	0.1	8.6	0.9
Cuba	2.0	0.9	6.9	0.0	8.3	0.7
Peru	7.5	4.6	8.7	1.6	15.4	2.5
Dominican Republic	19.8	16.2	21.1	3.6	40.6	6.6

and bacterial diarrheal diseases that account for 3.2 million deaths per year. Malaria killed 20+ million in Africa and India between 1847 and 1875 and continues its deadly pace at 3.1 million per year. Hepatitis B kills 2.0 million per year. Tuberculosis has killed its 100s of millions and continues to cause 1.5 million deaths per year world wide. Measles has killed many millions throughout history and even now kills an estimated 1.5 million per year. WHO estimates the world's burden of HIV/AIDS to be 44 million. If 40 million of these die in the next 10 years, by 2010 HIV/AIDS will have killed 60 million people in 30 years.[78]

In a global analysis of HIV/AIDS the most striking finding is the very low numbers of reported cases in Islamic countries. Islamic countries occupy most of Central Asia from Kazakhstan in the north to Pakistan in the south, west to Turkey, then south through the Arabian peninsula (the Middle East) and across all of northern Africa including Morocco and Mauritania on the west to Ethiopia and Somalia on the east.[79] Islam is firmly established in Bangladesh, Malaysia, and Indonesia.[79] The exceptions to this observation are in the countries near Ethiopia and Chad, where there is a mixture of Islam and tribal religions and Christianity.[79]

We have not as yet seen the full fury of HIV/AIDS in Sub-Saharan Africa. It will kill large numbers between the ages of 15 and 45. Productive work will be required of the old and very young. Life expectancy may fall to those found in the early 19th century. Already, the ten countries in the world with the worst life expectancies at birth, less than 35 years, are all in Sub-Saharan Africa.[80] Decimation of young and middle aged adults of two generations will create many orphans. There are already 10 million in Africa today and the projection is for 40 million by the year 2010. Lack of young people to work in occupations such as police, fire, security forces, farms, power generation, roads, railroads, parasite control, health and medical care plus other occupations important to society plus political instability in the region may bring serious secondary effects and dislocations. Tuberculosis, "the white plague," will become widespread and kill many without HIV. The secondary potential effects of the HIV/AIDS epidemic (famine and warfare) threaten more devastation than the illness itself. There are many other parts of the world where HIV/AIDS can get out of control, such as India, Southeast Asia and the Caribbean.

Can anything meaningful be done to stop the avalanche? The answer is probably not. Expensive HIV treatment only postpones death. It requires continuous attention to taking medicine and reliable laboratory monitoring, available in only a few places. If not taken properly the medicines can create resistant strains of the disease already reported in Africa.[81] Although much has been discovered in our research activities, we may be just as far from control as we were when we began. The development of a vaccine offers some hope, but even this may be wishful thinking.

In the Americas and Europe, HIV/AIDS affects people in the lower income strata and in anyone engaged in high-risk sexual and drug injection activity. Although it was identified first among white middle-class homosexual males and injection drug users, it is rapidly becoming a disease of urban, heterosexual black and Hispanic populations.

HIV/AIDS stigmatizes those who have it because its transmission is usually the result of socially unapproved or illegal behavior. Most would just as soon hide or deny it. Many countries in Africa have adopted policies of denial and even refused any help from outside. In parts of Africa you can be stoned for admitting it. It has prompted the most intense research on any illness to date.

Will HIV/AIDS be the great scourge? It is primarily a behavioral illness, and is often a result of behavior outside of the commandments. Change in behavior offers the only hope. The Lord's plan offers an end to the disaster, but people must accept it. This requires recognition of the problem and a determination to avoid all sexual activity outside of marriage. It requires that we follow the advice of Prophets and avoid injection drug use. Public health practices aside, if we do not change our behavior, it can become one of the biggest scourges the Earth has ever known.

Robert K. Maddock, Jr., M.D., FACP, is an internist and medical consultant in Salt Lake City, Utah.

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