

# Pathology Services in Developing Countries

## A Challenge

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*Go to the people, live with them, learn from them, love them. Start with what they know, build with what they have. But with the best leaders, when the work is done, the task accomplished, the people will say, "We have done this ourselves."*

Attributed to Lao Tzu, 604–531 BC  
Courtesy of Som Ock Kingsada, Dean  
Lao University of Health Sciences

The practice of pathology in the developing world—where the majority of the earth's population lives—presents special challenges for the Western-trained physician accustomed to the high standard of living, long life expectancy, and predictable disease patterns that are prevalent in the developed world. This health care gap will inevitably widen even further as sophistication of technology in our pathology laboratories increases by leaps and bounds, our ability to fine-tune diagnoses is honed, and as medicine becomes more personalized, while many developing countries struggle to provide even the most basic pathology services. This has inspired many pathologists and health professionals to attempt to bridge the gap. Several important such initiatives exist in the United States and Canada, as well as in many other developed countries. However, the situation on the ground is frequently complex, and such efforts may encounter challenges that cover the spectrum from the educational and cultural, to the economic and political. This may be especially daunting for pathologists who are highly trained to perform specialized and sophisticated analyses on problems that relate to the individual patient, to particular diseases, or to pathobiologic phenomena. Our training prepares us less well to deal with societal issues such as those that face the developing world.

These challenges are not unique to pathologists or indeed to physicians. The developed world has long struggled with both the practical and the theoretical aspects of aid, and great efforts have been made in this regard. It is estimated that \$2.3 trillion has been spent on various aid

programs during the past 5 decades in Africa alone, and some argue that there is relatively little to show for it.<sup>1</sup> Others maintain that the effort has simply not been of sufficient magnitude and that inequity and poverty will eventually be eradicated, given sufficient investment by developed countries, because the problems revolve essentially around a "poverty trap," that is, countries remain poor because they are poor.<sup>2</sup> Much work has been done by economists, either in the academic sector or by those working for various international bodies, analyzing a mountain of economic data in an effort to understand whether foreign aid helps, hinders, or is of no consequence. There is no consensus on whether a large, centrally coordinated effort—a "big push"—is what is needed, or whether the solution for poor countries will, of necessity, be found by innovative people "on the ground"—what Easterly<sup>1</sup> likes to call "Searchers." An example of the latter is the concept of microcredit, which was introduced by Muhammad Yunus,<sup>3</sup> recipient of the 2006 Nobel Peace Prize.

It is not our intention to enter this debate. It is, nonetheless, prudent for any pathologist who would like to get involved in developing countries to gain some familiarity with the issues. The philosophical principles are of more than theoretical relevance, as they help one understand how one's efforts can fit into a larger picture of aid and provide a framework within which one would like to make a contribution. We have taken the approach in our own work that the most valuable contribution a Western-trained pathologist can make in a low-resource environment, which nonetheless will invariably have its own unique strengths, is to respond to local needs through teaching, training, and collegial support.

Most developing nations have extreme shortages of trained medical personnel, including pathologists. Although pathologist staffing in North America and Europe varies from a low of 14 to 40 per million population, many developing countries are served by a small fraction of this, varying from 0 to low single digits. As an example, Uganda has 18 practicing pathologists for a population of 28 million, and Tanzania has 15 pathologists serving 38 million people. Training is highly variable, and availability of structured programs is at a premium. Training time tends to be short because of expense. Trainees who are fortunate enough to go abroad and attend programs in Western institutes of learning may on the other hand encounter difficulties in applying their new skills on their return home. This, as well as economic incentives and job market realities, leads to an inordinately high rate of "brain drain" from the developing to the developed countries as Western

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**Figure 1.** This generous donation of a tissue processor from a country in Europe to a hospital in Uganda was sent with a manual written in a language not understood by the histology technicians. It stands idle 3 years later.

countries have long relied heavily on foreign-trained physicians for the provision of their own manpower needs.<sup>4</sup> In addition to the direct emigration there is an indirect effect, when countries with a relatively high level of training, such as South Africa, lose their qualified staff to the West and then in turn attract medical personnel from other African countries. Compounding this problem are recruiting efforts by Western nongovernmental organizations and programs, such as those supported by the Organization for Economic Cooperation and Development, which tend to divert health professionals from frontline practice into their own projects by offering them higher salaries and benefits.<sup>5</sup>

Deciding what type of contribution to make is of fundamental importance, and it is not a straightforward matter. Sometimes, we donate our used equipment or books, without much thought as to how well these well-intentioned gifts fit the real needs. Gifts are graciously received and typically treated with a great deal of respect for the donor, which may on occasion mean that a nonfunctional and outmoded piece of equipment is kept in the limited space that could have been used for active equipment. Our Western laboratories would not usually install a complicated piece of equipment without having made some arrangement for its maintenance. Yet, complex machinery is sometimes donated to countries with a tropical climate, where things break down even more easily and where there may be no local expertise for fixing the problems that inevitably arise. This ineffective charity is unfortunately, on occasion, encouraged in some Western countries through providing the donor with a tax benefit. In other cases, donating equipment is a cost-neutral alternative to an expensive discard process, particularly when environmental concerns apply.

Donating books is certainly a good way to upgrade the local library, but the gift must respond to local needs. Language barriers may mean that textbooks and manuals written in the donor's language may not be understood by the recipients (Figure 1). Also, the subject matter may not be appropriate for their need; for instance, a manual on techniques in molecular pathology is not necessarily a

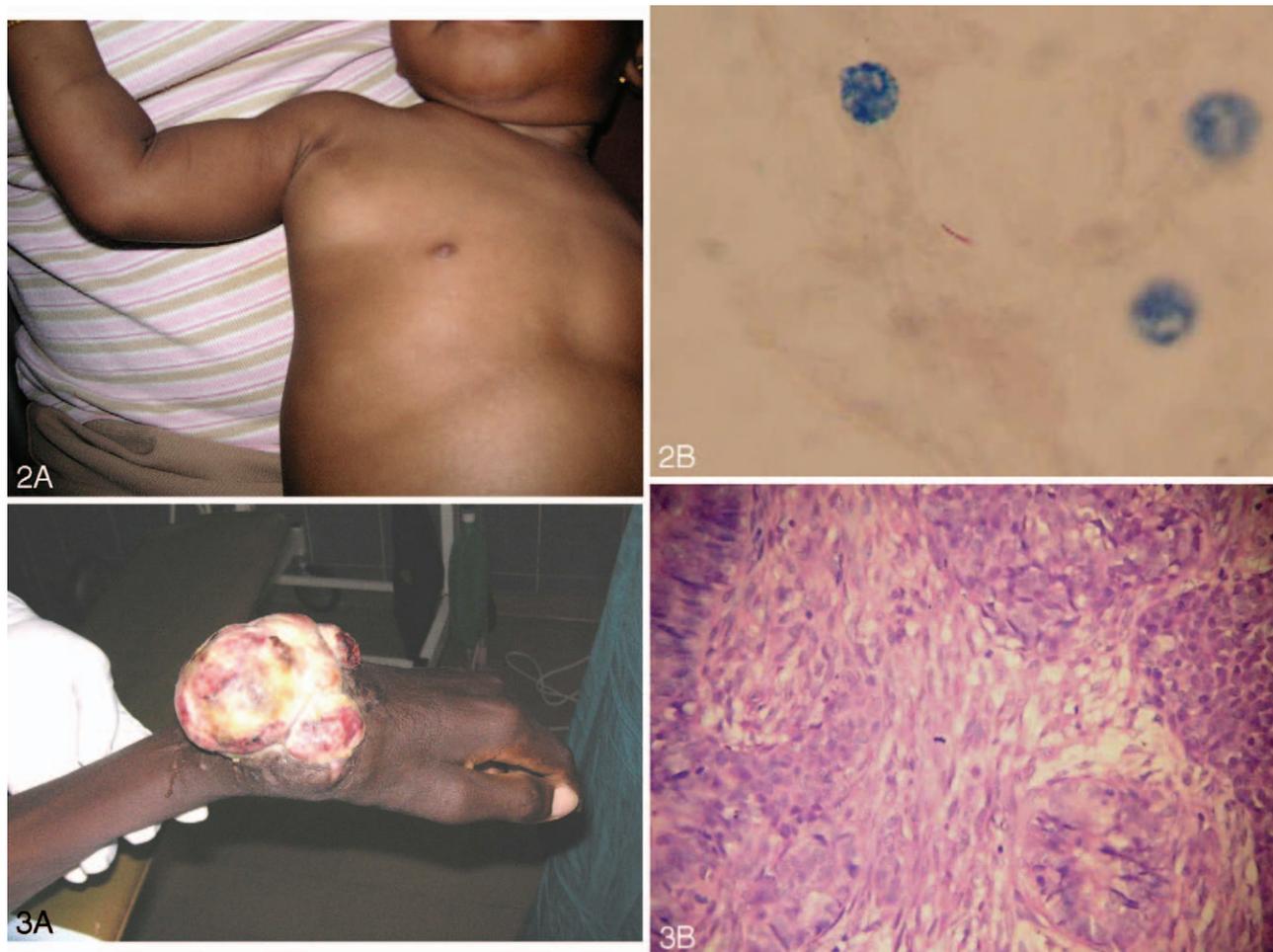
good first-line reference for a laboratory that is attempting to provide basic services under difficult circumstances.

The University of Calgary is involved in consultation projects in several countries. One such project was initiated at the request of Lao University of Health Sciences, Vientiane, People's Democratic Republic of Lao (formerly the Faculty of Medical Sciences, National University of Laos) and focuses on undergraduate medical education and training of primary care physicians with public health expertise. Two of us (J.W. and H.B.) have been actively involved in this project, assisting the pathologists in Vientiane. The problems they encounter are quite typical for many countries in the developing world. At the beginning of this project, this country of 5 to 6 million people had 1 pathologist.<sup>6</sup> Since then, another trained pathologist has arrived and there is a small number of junior staff in training, mostly locally. Laboratories are only present in the capital, Vientiane, and tissue-processing facilities are very limited. These pathologists perform the Herculean task of providing clinical services, as well as all of the pathology teaching for the undergraduate students in the country's only medical school. The numbers can, however, be misleading. Only a fraction of all surgical specimens will come to the attention of a pathologist, and this is typically determined by the patient's ability to pay. Consequently, health care statistics that are in any way based on pathology data, such as those for cancer, are more a rough estimate than an accurate reflection of reality.

Screening has had a major impact on reducing the incidence of cervical cancer in countries where it is practiced, yet this disease remains the most frequent fatal cancer of women where screening is absent. Although the procedure may be simple, cervical cancer screening requires a level of training and organization that may be difficult to achieve in situations in which resources and personnel are limited. This is certainly one area that lends itself very well to the talents and expertise of pathologists and here pathologists can make a large contribution to public health. The most cost-effective screening programs are likely to be a combination of human papillomavirus testing and cervical Papanicolaou smear screening with human papillomavirus vaccination preventing the disease in the long run.<sup>7</sup> A cost-effective treatment plan would also be required, and local administrative and financial cooperation is essential for long-term viability.

Fine-needle aspiration cytology holds great promise because it is a low-cost and reliable diagnostic technique in experienced hands, eminently suited for low-resource settings in which histopathology laboratories do not exist or open biopsy would be difficult (Figure 2, A and B). The technique can be taught by a consultant in a relatively short time, and the interpretation can be supported by telepathology and continuing education programs for local pathologists.

Autopsies are not widely practiced in developing countries, for several obvious reasons, including cost, cultural barriers, and lack of both facilities and trained personnel. As a result, reliable data that can only be acquired through autopsies and that might impact significantly on health policy and expenditures are not available. There is also a lack of forensic pathology expertise and practice in most developing countries. As a result, cause and manner of death may often not be as thoroughly investigated as desired. Again, pathologists' expertise and input would be indispensable in this area. Without autopsies and forensic



**Figure 2.** A, This infant acquired human immunodeficiency virus from her mother, in spite of antiretroviral treatment during pregnancy. At age 6 months, an axillary mass was noted. Open biopsy would have been difficult and a fine-needle aspiration cytology (FNAC) was performed. B, FNAC demonstrated acid-fast bacilli consistent with mycobacterial infection, and antituberculous medication was started. This is an example of how FNAC is particularly useful in a low-resource setting (Ziehl-Neelsen, original magnification  $\times 640$ ).

**Figure 3.** A, This locally advanced mass of the dorsal wrist in a young man had been growing for 2 years. B, Debulking was done and showed a biphasic population of mitotically active cells, consistent with synovial sarcoma (hematoxylin-eosin, original magnification  $\times 100$ ).

pathology, one can on occasion literally “get away with murder”; it is clear therefore that the provision of pathologic resources can have wide-ranging effects that range far beyond public health and into issues of social justice and the preservation of law and order.

It is well known that zoonotic disease, contamination of food and water, and inadequate nutrition are of extreme importance in many developing countries. Undoubtedly, the provision of clean water and healthy food, combined with proper waste disposal, would improve dismal vital statistics in the developing world. There is also great need for a much better understanding of the complex biologic interplay between wildlife, livestock, and human populations. Physicians tend to approach their work in a fragmented, rather than holistic, manner, and there is very limited collaboration between medical practitioners, veterinarians, and ecologists. The approach that has been termed “One Health” in a joint communiqué from the American Medical Association and the American Veterinary Medical Association represents a step toward recognizing and addressing this.<sup>8</sup>

Chronic diseases are also a growing concern in the de-

veloping world, as has been recognized by the World Health Organization.<sup>9</sup> Cancer is an orphan disease in the developing world in which diagnosis and treatment are generally utterly inadequate.<sup>10</sup> It is estimated that there are about 1 million new cancer patients each year in Africa, about 80% of whom are first seen at an advanced stage—the result of inadequate patient education, as well as a lack of available, affordable, and effective treatment (Figure 3, A and B).<sup>11,12</sup> This is an area where accurate and timely pathologic diagnoses are obviously needed to provide patients and their families clear information on which to base decisions about care, even when treatment is currently not readily available.

In summary, pathology services are rudimentary in much of the developing world. Pathologists from the developed world can play a critical role in providing support for locally adapted services in low-resource nations, acting in cooperation with local medical and government institutions. The most important donations that can be made are time, expertise, and collegiality, with training as the main focus, selecting those areas where we feel that our contribution would make the greatest long-term impact. It

is crucial that we better educate ourselves regarding the challenges of pathology in the developing world, but it is perhaps even more important that we bring this topic into the curriculum of our residents and students. The challenge belongs to all of us.

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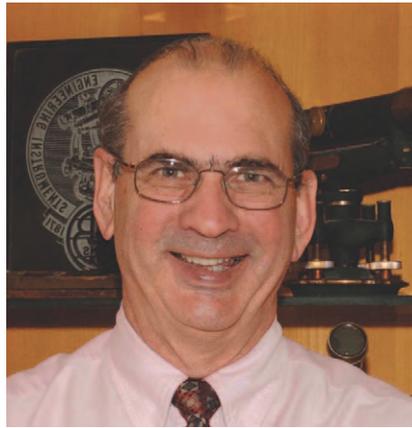
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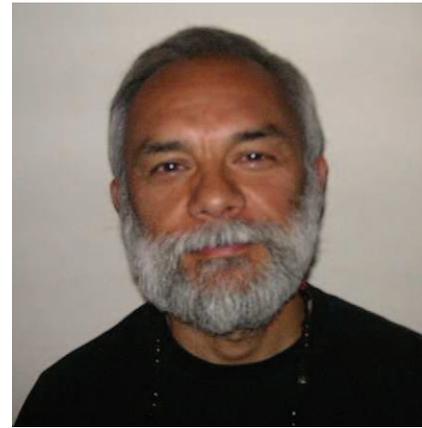
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Born and raised in Iceland, Dr Hallgrímur Benediktsson received his training in anatomical pathology at the Universities of Manitoba and Minnesota. He was professor and head of pathology, University of Calgary, from 1991 to 2004. His academic interests and most of his publications are in the area of renal and transplant pathology. He became involved in international work during a sabbatical leave in 2005 and has participated in projects in Laos and Tanzania.



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Dr John Whitelaw is a graduate of McGill University (MDCM) and completed his Fellowship in General Pathology (FRCP) in Kingston, Ontario, and Vancouver, British Columbia. He is currently a site director of laboratory services for the Vancouver Island Health Authority. He has been chief pathologist at Nanaimo Regional General Hospital for 25 years. In addition to his general pathology responsibilities, he has served as president of the medical staff and chief of staff at Nanaimo Regional General Hospital, as a member and chairman of several British Columbia Medical Association committees, and as a council member and president of the College of Physicians and Surgeons of British Columbia.



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Dr Indrojit Roy is a pathologist at St Mary's Hospital and associate professor at McGill University, Montreal, where he has worked and taught for 22 years, with a special interest in fine-needle aspiration cytology. He has volunteered in Madagascar and more recently in Uganda, where he provided diagnostic services and taught for 6 months at Nsambya Hospital, Kampala. He hopes to continue to help the development of pathology services in low-resource settings.