

Where the challenges meet the opportunities: the future of parasitology

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This lecture navigates through well-charted waters of medical and veterinary parasitology and leads to the vast uncharted waters of opportunities related to the crises and challenges caused by antroponotic and zoonotic parasites and pathogens. It also represents the interface that communicates among laboratory research, teaching, and field clinical practice.

All progress in humanity is generated by confronting and addressing its ever-evolving challenges. In the Western way of thinking, we tend to separate the words “challenge” and “opportunity”; consequently addressing them as different entities. In Eastern philosophy however, these two entities are perceived together. For example, in traditional Chinese, the word “crisis” is made up by two signs: one for “challenge”, and the other for “opportunity”, denoting that these concepts are inseparable. And logically, opportunities are created and evolved from addressing the challenges.

Infection disease authorities certainly would concur. A) Infectious disease outbreaks, epidemics, and pandemics; B) emerging infections; and C) neglected parasitic infections all represent serious challenges because they produce crises - some of them global. Parasitic infections are frequently understood as being attributed to tropical and subtropical regions. However, increased international travel, armed conflicts, climatic and vector ecology changes, new human immigrations and migration of animals, blood transfusions and organ transplants makes these infections more and more commonplace in developed countries.

The main infectious disease challenge today is to gain better access and understanding to real-time signal transduction mechanisms in host-infectious agent interactions achieved by genomic-approach technologies. The most pressing academic challenge in medical and veterinary parasitology is to improve, sustain, and expand the interface for communication between powerful scientific knowledge and the complexity and dynamics of host-parasite interaction mechanisms. It opens enormous opportunities for implementation of novel infection prevention measures such as: discovering new drug targets, improved serological diagnostic techniques and rapid molecular diagnostics, transmission blocking vaccines, novel vaccination strategies, and genetic modifications. The advances in medical and veterinary-important infectious diseases will gain enormously from decoding the dynamic aspects of host-parasite interactions in real-time fashion.

Currently, most emerging infections (over 75%) are zoonotic, resulting from the dynamic inter-connectedness of human, animal, and ecosystem health. The main challenge is to synergistically and comprehensively apply vast arrays of novel real-time surveillance technologies, molecular epidemiology techniques, bioinformatics and mathematical modeling, and biostatistics to assess and predict new emerging infections.

Medical parasitology faces numerous bioethical challenges derived from the complexity of field interventions. These challenges open unprecedented opportunities for community-based approaches for self-sustained and long-term infectious disease prevention and control programs. It involves targeting the population as a whole rather than only the most vulnerable groups.

Parasitologists are one of the best-fitted groups to address the above-mentioned challenges in a multidisciplinary fashion. Genomic-based technologies provide vast opportunities to investigate mechanisms of parasite pathogenesis, host resistance and immunity, genetic diversity and population genetics of parasite and host populations. The combined utilization of point-of-care diagnostic tests and molecular assays allow for more rapid diagnosis with increased sensitivity.

On the other hand, classic technologies will never die. Light microscopy still remains a powerful cornerstone diagnostic tool for many parasitic infections especially in the field and low-resource settings. And this is not going to change soon, as light microscopy provides quick epidemiological assessment of parasite burden in the areas under investigation. Thus there will always be a need for classically-trained expert parasitologists. Teaching parasitology by providing time and financially affordable short online training courses to targeted groups of health professionals to support their continuous education and to fill existing gaps is more necessary than ever.

Because of advances in today's technology, a young generation of parasitologists represents great intellectual power in combating the effects of infectious diseases. However, demand and supply in well-trained parasitologists has been mismatched for a long time already. Declined interest manifested in low academic recruitment in medical and veterinary parasitology students is predominantly driven by a shrinking job market due to: 1) great success of pharmacological giants in providing broad spectrum and effective antihelminthics, and 2) considerable efforts in combating the development of drug resistance in protozoa, helminths, and arthropods of veterinary importance.

Similar trends are observed in infectious disease clinicians although the underlying reasons are mainly monetary. Given the triple function of infectious disease clinicians in patient care, public health, and mandatory cost containment, they are more essential now than ever before as health care providers. However, the number of clinical students entering infectious disease programs significantly dropped over the last 10 years. An infectious disease career is considered under-recognised and under compensated, and this is something that demands immediate attention and amelioration.