



Viewpoint: Parasites and partnerships

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ABSTRACT

This text grew from a series of talks between a young science journalist trained in history and Marcel Tanner, global health expert with forty years of field experience in many countries in sub-Saharan Africa and Asia. At the very core of the series was the question of the successes and failures of global health initiatives at various points in time and in different locations. It also tackled the issue of which of the lessons learned in global health over the past thirty years could possibly be of importance for future scholars and decision-makers in the field. The topics touched upon ranged from new global partnerships to sustain the efforts to eradicate malaria and other diseases to new innovations in personalised health, not least for the world's most neglected populations. The views expressed here are based on scientific findings as well as personal experiences and hence are also inherently subjective. Having said this, we still hope that the rich body of evidence assembled over years of extensive field-work and research partnership is of some value to all those who still dare to embark on the adventure of global health research in a spirit of "mutual learning for change."

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1. Fascinating life forms

Considered from a biological point of view, regarding parasites only as life-threatening creatures might give the false impression. Most of them are in fact of stunning ingenuity and deserve our humblest appreciation. Take for example *Plasmodium falciparum*, the single-celled parasite responsible for transmitting malaria in many parts of tropical and subtropical Africa and South-East Asia. *Plasmodium falciparum* is responsible for 435,000 deaths per year and often affects society's most unfortunate and vulnerable members (WHO, 2018, World Malaria Report). But from a biological point of view, there lies considerable beauty in this life form. Through an infectious bite of a female *Anopheles* mosquito, plasmodia enter the body of their hosts. Via the blood stream they travel to the liver where they multiply asexually through cell division. Plasmodia infest the red blood cells, grow, and multiply exponentially, making the blood cells burst. This is the cause of the fever episodes an infected person experiences. After a while the plasmodia develop into male and female gametes. During this phase they eagerly await a change of host. During the next blood meal of an *Anopheles* mosquito, the reproductive cells enter the mosquito's intestines where male and female gametes merge. Upon entering the mosquito's salivary gland, the offspring from the fertilised egg are ready to infect a new human victim, thus completing this fascinating life cycle.

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2. Asking the right questions

Considering all the tricks and gimmicks of malaria parasites, this single-cell organism outstrips other pathogens such as viruses and bacteria in terms of sophistication. Undoubtedly, malaria seriously affects large swaths of the population. It prevents peasants in Africa or in India from cultivating his field and making a modest living. It causes complications during pregnancy, often leads to miscarriages, and is frequently the cause of dangerously low birth weights, not to forget that it takes the life of a child under 5 years every two seconds. Malaria inhibits social and economic development and accounts for a high disease burden. Of the 91 countries that reported indigenous malaria cases in 2017, fifteen – 14 of them in sub-Saharan Africa and India – carried 80% of the global malaria burden (WHO, 2018, World Malaria Report). These figures have been highlighted for good reason. The point here is that researchers who only focus on the suffering of the afflicted populations and who, in view of the many obstacles, almost despair at the task of making the world a more inhabitable place, will not discover anything and are probably doomed to failure. Only by acknowledging the ingenuity of nature and being fascinated by it, one will be able to raise the right scientific questions, contribute to the containment of the disease, and improve the performance of health systems to the benefit of the neglected populations. In our opinion, today's highly specialised research has somehow obscured the issue of science's social responsibility. For instance, many skilled researchers working in the burgeoning field of personalised medicine limit their efforts to sequencing new genes to add to the list of risk factors with regard to chronic conditions, without questioning how the knowledge about all the various risk factors will change human behaviour and the social fabric at large. We believe that only by putting society centre stage and working along the value chain, from innovation to application, can we address the upcoming challenges of the 21st century.

3. Mutual learning for change

In a globalised world, research partnership, of course, is the key to such an endeavour. The notion of partnership has had a stunning career in science and development talks. There is not a single “high-level meeting” where partnership between North-South, South-South, or whatever direction, is not praised. However, these good intentions evaporate as soon as one takes a closer at ground level. Partnership is, of course, not when a wealthy donor dictates the scientific agenda. Nor is it partnership when the different partners consider their various duties as tasks to be performed, instead of genuinely searching for a solution to a relevant problem. Partnership is not about helping others but about “mutual learning for change”. What we mean by partnership is perhaps best expressed in the very simple metaphor of a common journey. Experience has shown that in order to get far, every member of an expedition contributes what he or she has to share. One member has brought his fishing rod and a



Fig. 1. Babylonian language confusion (Illustration: Pia Valär, Zurich).



Fig. 2. "mutual learning for change" (Illustration: Pia Valär, Zurich).

box of matches for lighting a fire. Another has thought of a map and a compass and has an unfailing sense of orientation, also in difficult terrain. If everyone is an expert in map reading, the journey will not get very far because the members are most likely to starve to death during the venture. Thus, the most important feature of a successful partnership is the assignment of clear roles and responsibilities (Figs. 1 and 2). Without these, research partnership will never materialise. Roles and responsibilities can change during the journey, but everyone has to be able to tell at any time what his or her role and responsibility is (Commission for Research Partnership with Developing Countries, 2012).

Research partnership has a lot to do with creative listening. There is a stunning biological fact which, however, we often tend to forget: human beings have two ears, two eyes, but just one mouth. This means that, before hastily proposing "policy advice", one is well advised to listen and watch carefully. One sometimes gets the impression that new results emerging from laboratories or project sites are heralded too quickly as solutions to societal problems, without having them validated for the various cultural settings they are destined for. Creative listening requires a considerable degree of sensibility for local contexts. Our work experience in Tanzania during the 1980s showed that catching snails in potential transmission sites along the TAZARA-railway for the purpose of studying the epidemiology of *schistosomiasis* potentially resulted in the suspicion of being a South African terrorist. The challenge was to explain that this was not the case, and that you were actually not hunting for mere research data but working for the district authorities to find out how the disease is transmitted. At the time we also learnt that spending nights in the African bush was as important as forging ties with the district and regional authorities. Gathering around a small fire under the dark-green canopy of giant trees, you got a feeling for the place where you would be spending a couple years doing field-work. Moreover, it laid the basis for you being accepted locally because the villagers around you realised that you didn't need a tent of your own or four o'clock tea as did the colonial masters in the old days, and that you, too, were prepared to sleep around the campfire like everybody else.

4. Long-term investment

Partnership needs long-term investment. Conducting pilot projects here and there is probably not the right way forward if you really want to establish a sound research partnership. In the 1950s, the Swiss Tropical and Public Health Institute (Swiss TPH) in Basel established two research laboratories in Tanzania and Côte d'Ivoire, respectively: The Ifakara Health Institute (IHI) and the Centre Suisse de Recherches Scientifiques (CSRS) en Côte d'Ivoire. Since then, both organisations have developed into key players in health, nutrition, and ecosystems research and implementation in the respective countries (Meier, 2014). Four PhD students graduate at the Ifakara Health Institute annually, while the number of peer-reviewed publications amounts to more than a hundred per year (Irikefe et al., 2011).

The CSRS employs 170 administrative staff and over 100 researchers. Since 2000, over 25 PhD students have graduated from CSRS, three-quarter are African academics. As recent research has shown, in 2016 CSRS was the second-most prolific publishing institute in Côte d'Ivoire, behind Université Félix Houphouët-Boigny (Saric et al., 2018). The IHI and the CSRS are established as international, autonomous trusts, modelled on the Ifakara Health Institute in Tanzania. This model allows for a flexible mix of public and private partners embedded within national research agendas and under the guidance of an international board of trustees. The model has been adopted by other international research organisations across the southern hemisphere, including the Manhica Health Research Centre in Mozambique, the African Malaria Network Trust in Tanzania, and the International Clinical Epidemiology Trust in New Delhi.

Building trust and credibility based on mutual respect through capacity and institution building requires commitment, not least when things go downhill in political terms. This was also the case in Côte d'Ivoire when, after the coup of 1999, the country was plagued by civil unrest for many years. Numerous national universities were forced to close down, and scientists holding international passports quickly returned to their home countries, leaving the scientific community in tatters. As a centre with diplomatic status, CSRS quickly re-launched several community projects to assess the health and food situation in rebel-controlled areas of Côte d'Ivoire in an attempt to initiate a new generation of major projects and programmes (Bonfoh et al., 2011).

5. From the laboratory to the field...

Well-performing institutions and highly skilled partners are prerequisites for making scientific results available to those who need them most. The best science for the most neglected is required, and here we should not compromise. In order to achieve this, science has to proceed along the value chain from innovation, to validation, to application. Most scientists think of themselves as innovative. And probably rightly so. They develop new generations of insecticide-treated mosquito-nets or muse about new concepts in the social sciences. They leave their laboratories or desks with the intention of quickly applying their innovation to real-life settings. What is often missing, though, is validation. New tools have to be validated whether they scientifically work and whether they are socially accepted in a given context, before being up-scaled. The new malaria vaccine candidate RTS,S is a case in point. Developed by GlaxoSmithKline (GSK) it proved very promising in laboratory research. However, extensive multi-site trials in eleven countries across Africa, including the Ifakara Health Institute in Tanzania, have shown that the vaccine is only partially effective (The RTS,S Clinical Trials Partnership, 2011). These insights are now subject to the debate under which conditions the vaccine could be applied alongside other preventive measures. The World Health Organisation has demanded further clinical evidence from trials in Ghana, Kenya, and Malawi. Thus, instead of conducting a single laboratory experiment and believing that one has now made a significant contribution to humankind, one should first have the results thoroughly validated. Only through validation together with the people living in diverse social and cultural contexts, does it become clear whether or not such an innovation could possibly be up-scaled.

6. ... and from the field back to the laboratory

As we hope to have made clear: the process from innovation to application is not a one-way street. Laboratory and field research are closely intertwined. Innovation – if it deserves the name – should be tailored to local contexts and integrated into the respective health and cultural systems. It must be socially acceptable as well as scientifically viable. In order to meet such high expectations, scientist should every so often leave their comfortable labs in cosy Europe or the US and immerse themselves in foreign cultures, and simply listen and watch with curiosity. This would sharpen their senses in order to ask the right questions and become involved in solving the problems really relevant to society. For instance, simple observations of malaria patients admitted to rural hospitals and dispensaries in Tanzania in the 1980s revealed that the by then widely used antimalarial chloroquine was no longer effective (Tanner et al., 1987). The vigorous *Plasmodium falciparum* had developed new mechanisms to circumvent the drug's mechanisms of action. This first scientific evidence of chloroquine resistance in Tanzania was passed on to the pharmaceutical industries back in Europe along with the call that new chemical compounds against malaria were urgently needed. Notably, the steps undertaken in the process also won the recognition and trust of the Tanzanian government, resulting in a long-lasting partnership ever since.

Box 1 Ifakara Health Institute, Tanzania.

Ifakara Health Institute (IHI) in Tanzania

In 1957, the Swiss Tropical and Public Health Institute opened its field laboratory in Ifakara. Over the last 60 years it has developed into the Ifakara Health Institute (IHI) – one of the most renowned research institutions on the African continent (Tanner et al., 1994). The IHI combines research, teaching, and training as well as services. It currently employs over 380 staff members, 150 of which are scientists. They are dedicated to developing new strategies against infectious diseases such as malaria, tuberculosis, or HIV/Aids. In the 1990s, the Institute conducted the first malaria vaccine trial in sub-Saharan Africa and has been crucial for malaria vaccine development ever since. It has been selected as one of the 11 trials sites for the effectiveness trials of the

malaria vaccine candidate RTS,S/AS01 which commenced in 2009. In collaboration with the Swiss Tropical Institute in Basel, IHI-scientists achieved a high impact on the health of rural populations when they worked on insecticide-treated bed nets. Large-scale trials in the Kilombero district reached 500,000 people and reduced infant mortality due to malaria by 30%. Not least thanks to the work of IHI, Tanzania reached the Millennium Development Goal #4 (Reduce child mortality) already by 2010. In recognition of its many achievements, IHI was awarded the prestigious Prince of Asturias Award for International Cooperation in 2008 together with the Manhica Health Research Centre in Mozambique, Malaria Research Centre in Bamako, Mali and the Kitampo Health Research Centre in Ghana.

Box 2 Centre Suisse de Recherches Scientifiques en Côte d'Ivoire.

Centre Suisse de Recherches Scientifiques (CSRS) en Côte d'Ivoire

Founded in 1951, the Centre Suisse de Recherches Scientifiques (CSRS) was Switzerland's first research institution in Africa. Covering diverse fields such as health, nutrition, urbanisation, and ecological research it has become one of the major hubs of Swiss-Ivoirian research partnership under African leadership. Nutrition and especially question of food security has become an important research branch of the centre. In 1998, CSRS-scientists introduced new yam varieties to Côte d'Ivoire which were both of high quality and locally accepted. Primatology and biodiversity in the unique Tai Forest are other important fields of research. Under the paradigm of "one health", scientists study the health of animals as well as humans to contain the spread of zoonotic diseases. A recent study on chimpanzees in the Tai forest revealed that several plants eaten by chimpanzees could also have therapeutic effects in humans (Ahoua et al., 2018). Moreover, health research at CSRS includes innovative approaches to fight parasitic worm infections, combining chemotherapy, latrine construction, and health education programmes in schools. In 2012, the Centre established the Taabo Health Demographic Surveillance System (HDSS), a unique database comprising economic, demographic, and health-related data of 40,000 inhabitants living in south-central Côte d'Ivoire. This platform allows researchers not only to determine the impact of health interventions but also to embark on scientific studies, such as on the causes of anaemia and local concepts of anaemia-related illnesses.

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