

levels comparable to LmFn-infected mice (Figure 1B). These findings might have potential clinical applications in the future to treat nonhealing cases of leishmaniasis in humans. Nonetheless, further investigation will be required to understand how depletion of MRC1<sup>hi</sup> cells could regulate the outcome of the diseases in human patients without impairing skin repair or causing other unexpected complications.

Another potential clinical application has the above described redifferentiation of dermis M2-like macrophages to M1-like macrophages with M1 stimuli that resulted in clearance of the LmSd parasite in infected cells. Repolarization of M2-like macrophages to an M1-like phenotype is already being considered as a therapeutic strategy in tumor immunotherapy [10].

In summary, the study by Lee *et al.* [6] provides new insights into the longstanding puzzle of nonhealing infection with the *L. major* strain LmSd. As yet unidentified adaptations by this parasite promote a sustained, long-term persistence in the dermis that is resistant to the strong Th1 response. This suggests that the LmSd parasite may have evolved by changing its cell-surface oligosaccharide structures to infect and survive in a specific niche – the MRC1<sup>hi</sup> P4 dermal macrophages. Looking forward, it will be interesting to identify the LmSd epitope responsible for the invasion of MRC1<sup>hi</sup> cells and to establish whether these or different mechanisms are responsible for other nonhealing leishmaniasis.

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## Forum

### Collaborate or Collapse: Capacity Building in Zoonotic and Neglected Tropical Disease Modelling

Siti Nursheena Mohd Zain<sup>1,3,\*</sup> and Maria-Gloria Basáñez<sup>2,3</sup>

We share the insights from a successful collaboration in organizing and implementing an international scientific capacity-building workshop in Malaysia titled *Mathematical Modelling of Neglected Infectious Diseases*:

**Capacity Building in Southeast Asia.** This workshop focused on the delivery of technical know-how and on essential soft skills related to effective grant proposal writing and networking.

#### Introduction

The academic world today has become much more challenging as researchers face increasing pressures to publish and compete for increasingly scarce funding resources. The research landscape has further become much more complex and interdisciplinary in nature, requiring expert inputs from multiple sources. Researchers have adapted to these new challenges by increasing collaborative research and other joint activities. Against the requirement to ‘publish or perish’, we now must add the adage: ‘collaborate or collapse’. The pursuit of scientific knowledge naturally is a lonely journey – the popular image of the scientists cloistered in their laboratory and spending long hours peering into the microscope is not far from the truth. However, the process of discovery and knowledge creation is necessarily an iterative process that combines hours of solitary contemplation with moments of social connection. The process of sharing information becomes a source of validation, an opportunity for critical feedback, and a deepening of scientific enquiry.

Collaboration, however, is not a given. It is certainly not a subject that is taught in university. It is also not simply about the sharing of information. Rather it is concerned with the teamwork behind the creative success of scientific projects. Such teamwork does not happen naturally and requires the building of cohesion between members towards achieving a common goal and providing the necessary mentoring so that more experienced members may help younger members to navigate effectively.

What, then, are the key elements for a successful collaboration? How can one develop these skills? These questions apply particularly to early career scientists who may not have sufficient tools to navigate the new challenges of academia. In this article we address this issue by sharing the key lessons from a recently successful collaboration that resulted in the organization of a multidisciplinary and multinational workshop in Malaysia: Neglected Diseases in SEA: Building Capacity in Epidemiological Modelling (from August 28, 2017 to September 1, 2017), supported by the Newton-Ungku Omar Fund (NUOF), an integral part of the wider Newton Fund umbrella<sup>1</sup>. We frame these lessons by describing three important components of the researchers' world – networking, mentoring, and nurturing.

### Networking

Networking involves building and maintaining contacts and relationships with others. In academia this process can take place on all manners of platform – from the mid-morning coffee breaks (characteristic of British universities) to Whatsapp groups and participation in scientific seminars. Networking helps to broadcast one's existence to the community and, more importantly, provides the building blocks for developing trust between individuals. Trust is an important element in any relationship and is especially so amongst scientists who fiercely guard their data and know-how. This is why it is not easy to form scientific collaborative relationships virtually utilizing social media. Only when trust is established can the sharing of knowledge and resources take place. A tried and tested 'trust' mechanism is the influence of the personal introduction.

In this case study, the lead author, based in Malaysia, was taking a sabbatical leave to acquire new skills and tools in the mathematical modelling of infectious diseases. In order to find a suitable host for

this highly technical subject she reached out to her PhD supervisor, based in Britain, with whom, over the years, she has built and maintained a personal and research relationship. Through his understanding of her Southeast Asian context, and what she needed intellectually, he was able to identify the host who would best meet her requirements. This in turn required tapping into his network of scholars based in Britain to help make the necessary introductions that would enable the hosting of the author during her sabbatical period.

By utilizing her personal networks, the author was able to access a wider pool, in various regions of the world, to help her gain more information and identify relevant options. Her network, further, was able to assist her in making communication and negotiating with the personalities and institutions that would eventually host her. Thus, networking functioned as both a source of information for decision-making and an enabler for establishing the professional relationship between scholar and institution.

### Mentoring

In academia the mentor plays an almost pastoral role, offering not only knowledge sharing but other forms of tangible and intangible support. The best mentors share their career experiences, personal knowledge, skills, and networks. Mentoring is not normally an entry that one puts in their CV, or a job obligation one needs to fulfill, but rather stems from a genuine interest in supporting a colleague or student in advancing their career. This role includes helping the mentee to identify goals and recommending pursuits to develop specific areas for professional advancement. This relationship does not only benefit one party. Mentors also can develop useful skills in supporting and motivating others while broadening and deepening their own network and community of practice.

My host, and co-author, is a recognized expert with extensive years working on parasitic diseases modelling and capacity building in Latin America and Africa [1–4]. During our early interactions we discovered an opportunity to create broader linkages with similar work conducted in Asia. An important aspect of the relationship was her willingness to share knowledge and professional guidance as I set about with my work programme. The mentoring environment she created helped me to learn about the work being done in Africa which, in turn, allowed me to identify important gaps in the way infectious disease epidemiology was addressed in Southeast Asia (SEA). It was through these exchanges that an idea began to coalesce to bring this modelling tool across to SEA where the field is still underdeveloped.

Both of us worked together to crystalize this idea in the form of a grant proposal to organize a capacity-building workshop in the mathematical modelling of neglected and vector-borne diseases in the region. Coincidentally, the prestigious Newton Researcher Links Workshop Grants call was open for proposals and provided a timeline for us to focus our efforts. The grant criteria required strong linkages between capacity building and creating policy outcomes related to the economic development of partner countries. We both tapped into our networks to identify the most suitable talent to construct our team and shape the programme. These included experts from five institutions in the UK and Malaysia who crafted the technical aspects of the modelling with the implementation experience in Africa and how such models may be adapted to the SEA context. With a clear policy-oriented framework and strong content, and supported by a highly competent multi-national team, we received the happy news, 5 months later, that our grant proposal was successful.

## Nurturing

The third component for successful collaboration is the nurturing component. In effective research collectives the team is never homogenous, and its dynamics are shaped by the diversity of its members – from seasoned scientists, to mid-career and freshly minted PhDs, coming together with different sub-disciplines and specializations. Social hierarchies may provide obstacles towards successful teamwork – impeding effective communication between members and limiting the potential for creativity and knowledge synthesis.

An important element in the design of the workshop was, therefore, to build the capacity of younger researchers to become effective team members. Hence the workshop adopted two key objectives: the first was to impart the latest know-how and provide capacity building in epidemiological modelling of zoonotic and neglected tropical diseases adapted to the SEA context. The transmission of content was instructional and utilized the 'R' program – a software environment for statistical computing and graphics (The R Project for Statistical Computing<sup>iii</sup>). Tackling all key modes of disease transmission relevant to the region, participants were trained to model viral (rabies), bacterial (leptospirosis), helminth, and vector-borne (malaria) diseases.

The second objective was to train the participants in communication and collaboration skills. The majority of participants were early career researchers at postgraduate level from seven countries – Bangladesh, India, Malaysia, Mexico, Portugal, Thailand, and the UK. Taking on an interactive format, two modules

were introduced that focused on effective grant-proposal writing and professional networking. This nurturing aspect of the workshop was unique and helped to create a highly conducive environment for learning and knowledge sharing, in addition to strengthening the bond between participants and trainers.

## Concluding Remarks

This case study highlights an issue that typically does not receive sufficient discussion but has a serious impact on the effectiveness of scientific collaboration. It describes how aspects of networking, mentoring, and nurturing were employed in the inception, design, and implementation of an effective capacity-building workshop as a platform for scientific collaboration. Furthermore, it shows how these three components interacted to deliver a successful outcome in the international workshop on mathematical modelling of neglected diseases organized in Malaysia. With a deeper appreciation of the social dynamics of scientific collaboration, and greater care given to its constituents, more effective teamwork and partnerships may be created for the advancement of scientific knowledge.

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## Resources

<sup>i</sup>[www.britishcouncil.my/programmes/newton-ungku-omar-fund/researcher-links](http://www.britishcouncil.my/programmes/newton-ungku-omar-fund/researcher-links)

<sup>ii</sup>[www.newtonfund.ac.uk/](http://www.newtonfund.ac.uk/)

<sup>iii</sup>[www.r-project.org/](http://www.r-project.org/)

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