Seven Tips for Aspiring Biomedical Scientists in a Developing Country

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Introduction

Low-income countries are generally characterized by a disproportionately large share of the global burden of communicable and non-communicable diseases. One would reasonably expect that the solutions to these problems be home-grown. Unaccountably, the capacity for this is wholly lacking, an overwhelming majority of African countries fall well below the average on standard indices of science and technology capacity [1]. Besides this, over the years, these countries have witnessed a steady drain of qualified staff, which has led to low scientific research output, weak preparation of the next generation of biomedical scientists, and at some extent, doubt about the capacity of African universities and research institutions to produce globally competitive graduates [2,3]. Therefore, becoming a productive and successful biomedical research scientist in a low-income country is a real challenge, but first of all, is a matter of devotion. In addition to having the commonly required traits a good scientist should have like a strong academic background, curiosity, team work ability, honesty, discipline, integrative knowledge of related fields, ability to accept and give criticism; young scientists at the end of their academic training need to understand, both the advantages and challenges of their society and working environment for the good of their communities, and for their one interest as aspiring professional scientists. This prompted us to design the following seven tips, which addresses in priority for those working in the field of biomedical research and development.

Tip 1: Understand the Needs and Priorities of Your Country

As part of a low-income country, our primary obligation as scientists is to contribute to the welfare of our society through generating knowledge, idea and goods, which ideally should be applicable in solving health problems. Therefore, the knowledge of the major threats in your country is crucial, before you start any research. A mastery of technology capacity [1]. Besides this, over the years, these countries have witnessed a steady drain of qualified staff, which has led to low scientific research output, weak preparation of the next generation of biomedical scientists, and at some extent, doubt about the capacity of African universities and research institutions to produce globally competitive graduates [2,3]. Therefore, becoming a productive and successful biomedical research scientist in a low-income country is a real challenge, but first of all, is a matter of devotion. In addition to having the commonly required traits a good scientist should have like a strong academic background, curiosity, team work ability, honesty, discipline, integrative knowledge of related fields, ability to accept and give criticism; young scientists at the end of their academic training need to understand, both the advantages and challenges of their society and working environment for the good of their communities, and for their one interest as aspiring professional scientists. This prompted us to design the following seven tips, which addresses in priority for those working in the field of biomedical research and development.

Tip 2: Learn How to “Do More With Less”

One of the features which all the low-income countries have in common is certainly, the poor engagement of authorities in research, either in supporting researchers or in translating results into products and goods. The situation is even worse, when it comes to biomedical research. This condition makes researchers to be largely dependent on external funding. "Doing more with less” implies your ability to constantly adapt yourself to any financial budgetary stress or unforeseeable change. Skills in financial resource management are therefore very fundamental, since most of the time resources are sporadic. A recent study observed that only 16.92% of postgraduate students and researchers based in their home country receive full financial support, from their host institution in Africa. Consequently, they are destined to either sponsor their research personally or seek funding elsewhere. Furthermore, access to scientific papers was also noticed to be a nightmare to most African researchers with limiting factors, including lack of internet access or connection problems, frequent power failure, and/or lack of money to cover the costs [3]. It is therefore, obvious that working in such conditions requires indubitable managerial skills. As beautifully described by Royal and Agnew [4], as a team leader, you will need 1) to specify "must-win" battles (more feasible research projects), 2) avoid the trap of routines, 3) treat training as a process, not an event, and 4) provide “specific freedom to act” by clarifying the scope of employee's authority, so that interpersonal conflicts be minimized. Achieving more with limited resources also requires being realistic and focused. It is important to define long term goals for your research team as well as personal targets, and strategize on these while remaining are constantly flexible. Avoid choosing research topics that are financially difficult to achieve, or which are pursued by more powerful research institutions. However, as an early scientist, you may need to work on topics with universal interest, too.

Tip 3: Collaborate With Local Non-Governmental Organizations If You Are Not Part Of One

Nowadays, it is no more reasonable to envisage conducting research in isolation, especially in the field R&D. For example, multilateral malaria research and control programs in Africa have regained prominence recently, as bilateral assistance has diminished [5]. However, local Non-Governmental Organizations, confessional organizations and other home-borne structures may be exceptionally

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useful, especially when it comes to field research. Biomedical research may require biological sample collection from human participants or the environment (animals, plants, soil, etc.). To succeed in this, you need not only to obtain ethical and administrative clearances from authorities, but also a good collaboration with local communities is crucial. Local organizations which are more familiar with these communities could easily bridge the research scientist with the targeted populations. This is also important for follow up and feedback. Definitely, local organizations play a key role in the translation of result findings into applicable knowledge, for the good of the society. However, the collaboration should be based on sincerity and honesty, and the mutual interest of the different stakeholders, in term of co-authorship in scientific papers arising from the work, the impact of the research outcome on individual career, financial or other benefits have to be spelled out clearly, right at the start of the project. This helps the parties to avoid unnecessary misunderstandings and conflict of interests.

Tip 4: Work With Academics if You Are Not Part of Them

The marriage between research and teaching has an old history of success, but also challenges. A major challenge faced by developing country is to sustain research training, especially at the University level. Combining research and teaching appears as the cheapest way of solving this problem. It is even the best way to easily build research capacity in low-income countries. Reciprocally, postgraduate students may constitute less costly and available man power to core-researchers. Teaching may also be the best way of communicating on your research, especially if the subject taught is directly linked to the topic or area of research. A good researcher should therefore, never hesitate to bring his research into his classroom. If you cannot have at least a part-time teaching job, especially with postgraduates, then get the minimum available which is to collaborate with academics.

Tip 5: Be Part of International Networks in Your Research Field

There is a growing interest in biomedical science in the developing world, in general and the African continent, in particular. The emergence of North-South and South-South networks across Africa, like the Multilateral Initiative on Malaria (MIM) with headquarters in Cameroon, the African Malaria Network Trust (Tanzania), the newly created African Network for Drug and Diagnostics Innovation (ANDI), Build African Research Capacity (Build AReCa), African AIDS Vaccine Programme (AAVP), represents a unique catalyst to biomedical R&D on the continent. They are invaluable forums for experience sharing and fruitful collaboration. Be part of it! Focus on selected ones in your research area and contribute to their activities. Don't be shy to apply for membership, if you feel qualified for it. Attend at least one international conference every year and present your research findings or ideas; you will not lose, but you will instead gain a lot. It is not reasonable to believe you can carry out a whole research project alone; you may need to collaborate and work with other people out of your institution or abroad. Today, collaborative project are highly encouraged, and consortia have become real giant and unbeatable research "gurus".

Tip 6: Communicate, Share And Publish!

Within your research team and with your partners, communication is crucial. At times, assumption can be very frustrating to a well-conceived project and even your relationship with your key collaborators. Always discuss every following steps of the work, as you move together. Your mentors are resourceful person to you and may be your best collaborators; keep in touch with them, even if you are no more working together. Participate in lab seminar or departmental scientific meeting within your institution; share your experience with others, both junior and senior ones. By doing so, you definitely gain from their own experiences, at times unconsciously. Why publish? A research lab can be assimilated to be a factory, where the scientist (fabricant or manufacturer) spends his/her time looking for solutions (goods) to health issues in the society. The journals for their own, can be assimilated to the market where the goods are presented and sold. Even if I wouldn't project the "Publish or Perish" philosophy, I should admit that publication is the main way for scientists to express themselves, and make their knowledge and discoveries available and usable by the community. Submit your findings to well exposed journal, especially open access ones. Like for all OMICS journals, abstracts and full texts are accepted by the Journal of Biotechnology and Biomaterials (JBTBM) and are freely accessible to everyone, immediately after publication. This approach makes JBTBM and other OMICS journals, an affordable and available source of information, especially for scientists working with limited resources in developing countries.

Tip 7: Stick To Ethics

Potential research participants of the low-income countries are weaker by their illiteracy and the rampant poverty. These people therefore, constitute a delicate research actor or targets, which should constantly be protected against any form of violation of ethics. It is your responsibility as scientist to adhere to and protect ethical regulations of your country. Do not hesitate to be part of ethical review bodies of your country, if you feel you can contribute. Locally, avoid any form of cheating within your research team, even if you are not the team leader. Treat everybody around you equitably, and your team members will feel encouraged and collaborate even better. At the international level, unfortunately till today, mostly because of their constant lack of infrastructure coupled with poor research planning by most of their institutions or governments, scientists from developing countries have not always been given a preponderant position in international research collaboration, compared to their peers of developed world. As result, most of the time these countries are considered as mere grounds for "sample collectors", and ethics is not always respected with regard to the research participants, even in clinical research. It is therefore, the responsibility of the home-scientists to protect their own rights, as well as to secure their participants who are at the same time members of their communities.

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