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EDITORIAL
PROMOTING LABORATORY-BASED SCIENTIFIC RESEARCH IN KENYA: ARE WE FLOGGING A DEAD HORSE?

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Medicinal chemistry and allied biochemical sciences are an essential part of the drug discovery and development process. Countries with a well established pharmaceutical industry base are necessarily backed by a strong basic sciences research base. Sub-Saharan Africa continues to lag behind the rest of the world in biochemical research output and consequently in pharmaceutical output. A spatial scientometric study carried out by Csomos on scientific output between 1986 and 2015 confirms that scientific output is mainly centered in the developed world (https://arxiv.org/ftp/arxiv/papers/1709/1709.07183.pdf).

The Kenyan government has recognized the importance of science in industrial development. In this regard, the government continues to promote education in the science, technology, engineering and mathematics (STEM) fields. The emphasis has, however, mainly been in the formative training years, with many STEM teachers trained and employed to teach high school students. Such students encounter a shock when they join universities to find the institutions deficient in laboratory infrastructure and unable to offer adequate practical exposure. It would appear that there is little concern about what happens to those who want to pursue scientific research at advanced levels. It is no wonder that many science graduates travel out of the country to pursue their scientific interests, partly contributing to brain drain.
What can the Kenyan government do to foster scientific output? Recognition of the importance of science in national development requires the government to work closely with research and academic institutions. This will ensure that research first and foremost serves national interests, Some specific areas of concern are discussed below.

Infrastructure. There is need to invest in scientific infrastructure in terms of buildings designed for purpose. For instance, universities are plagued with space constraints. Thus researchers have no dedicated space for equipment and operations. Donor organizations are reluctant to fund infrastructural projects. In the developed world, the government is the biggest investor in research infrastructure. Expecting foreign governments to invest in basic infrastructure (the so-called brick-and-mortar) is akin to surrendering our sovereignty.

Equipment. The installation and maintenance of certain pieces of equipment such as spectrometers for mass, nuclear magnetic resonance and atomic absorption/emission analysis are capital intensive. Such equipment are best acquired and operated at institutional or national level. This leaves individual researchers to focus on consumables and smaller pieces of equipment which donors can readily fund. The introduction of the Kenyan national research fund with an infrastructure component in 2015 was a welcome move. However, to date the inaugural winners of the grants have not been funded. Recently, there have been undertones that the reason for this was a government-imposed freeze on infrastructure projects. It is imperative to draw a clear distinction between scientific research projects and other development projects in order to delink science from politics. With the lack of basic equipment, researchers have to rely on collaborators or pay laboratories outside the country to test their samples where feasible. This adds to the cost of research through the fees charged, the transport costs and also the loss of time associated with shipping samples and waiting for results.

Consumables and reagents. As a country, we import most of our reagents and consumables. A simple comparison of purchase prices for basic reagents and consumables on websites such as Sigma Aldrich in

South Africa, Europe or the USA with the prices quoted locally shows that Kenyan prices are disproportionately way above the global average. This situation perpetuates lack of competitiveness in African research. The high prices obtaining locally can be attributed to many factors including shipping costs and mark-ups. However, the most remarkable factor is taxation. Items meant for scientific research, including equipment are not exempt from taxation, thus pushing their costs up sometimes to >200% of the sale price. The marketers take their cue from the government and apply exorbitant mark-ups. At the international level, suppliers may consider allowing researchers in sub-Saharan Africa to purchase items directly rather than through middle-men and agents.

Procurement. Subjecting purchase of research to public procurement rules has a number of shortcomings. First, the drawn-out procurement process takes a lot of time and the endpoints are usually unpredictable. The research process has defined timelines that allow for only tiny deviations from the work plan if set objectives are to be met. Thus public procurement needs to be modified and adapted to research needs. Secondly, procurement introduces an opportunity for exorbitant pricing, further driving up research costs. In particular, when grants are involved the procuring authorities assume that the money involved does not belong to the researcher and can be used with abandon. Thirdly, in many cases the researchers find themselves isolated from the purchase process. The procuring entity may then end up procuring items that do not meet the researcher's specifications.

Incentives. In many countries, researchers are rewarded for their research output (https://www.sciencemag.org/news/2017/08/cash-bonuses-peer-reviewed-papers-go-global). A recent report indicated that researchers in China were making the most money from payment for publications compared to their peers globally (https://www.enago.com/academy/paid-to-publish-the-chinese-cash-cow/). A system of incentivizing and recognizing research output, when properly implemented, motivates researchers to maintain an active research profile.

In conclusion, a lot needs to be done at the national and institutional levels to promote scientific research. Some measures that can help include increased government funding for science research at tertiary level, provision of basic infrastructure and equipment, zero-rating taxes for research inputs and changing of existing procurement rules.

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