



Across the border: Physiological Sciences on the African continent



Interview with Prof. Amal Saeed, current president of the African Association of Physiological Sciences, and an invited plenary speaker at the 2014 Annual Congress of the Physiology Society of Southern Africa

Prof. Saeed, we wish to thank you for participating in this interview and for making the necessary time available. The PSSA congress is at hand and there is excitement re the African connection at this year's meeting – we are looking forward to your contribution.

Q What are your research interests and what type of techniques are you using for answering the questions in your research environment in Sudan?

A We are interested in understanding the effects of intake of Gum Arabic – a natural gum of hardened sap from acacia trees found in our region - on metabolism and its impact on various disease states e.g. body weight, malaria (as a novel therapeutic intervention). I am very interested to gain insights into the underlying mechanisms whereby Gum Arabic can mediate its beneficial effects, and this is a key focus of our laboratory. We typically employ ELISA's, Western blotting, spectrophotometry, immunoassays, and also gene array technologies. However, most of this is done in the laboratories of our collaborating partners.

Q What are the major research questions and research priority areas in your country?

A Our country is mainly faced with endemic diseases e.g. high vulnerability to malaria, tuberculosis, schistosomiasis, cholera, leishmaniasis. For example, at the University of Khartoum where I am based we have an Institute of Endemic Diseases specifically that focuses on such pressing problems. There are also

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FINAL NOTICE for PSSA 2014 Congress delegates

- Delegates should be aware that the congress booklet will NOT be printed this year and instead only be available in electronic format (on memory stick).
- All delegates therefore need to bring along their laptops, tablets and/or other e-devices to access the abstracts.
- The final congress program will be e-mailed before the meeting and delegates will need to make their own printed copies if this is preferred compared to the electronic format.



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other problems such as the matter of good and adequate nutrition, non-communicable diseases and child maternal health-related issues.

Q How is the funding situation in your environment, both for research per se and for student scholarships? Who are the main funding bodies and how competitive is the environment to secure funding?

A Our research work is usually funded by the host university and/or the Ministry of Higher Education. In addition, we also apply at international funding agencies such as DAAD, TWAS and as collaborations with other universities.

Q How is the situation around equipment availability and access?

A The lack of good laboratory equipment is a real problem and makes it difficult to conduct world class research. Due to this problem we have to form collaborations with researchers in developed nations and then do most of our laboratory work abroad as collaborative projects. In an ideal world, we would also like to have access to equipment such as a flow cytometer, thermal cyclers for real-time PCR, state-of-the-art microscopes, and excellent animal laboratories and facilities. However, this is a difficult problem and is of course dependent on adequate funding!

Q How much time in general do you dedicate to teaching and in what relationship does that time stand to the time dedicated to research activities?

A Unfortunately, we have very little time for research work and most of our work efforts are centered around teaching. Together with the problems I highlighted earlier, this will further hamper efforts to establish a strong research culture in our laboratories and institutions.

Q What are the challenges in the teaching environment?

A The real challenge for us is the increasing number of students that enrol for degrees and courses, while at the same time there is a decrease in staff numbers. This makes it very difficult to adopt interactive small group teaching. In addition, limited journal subscriptions are available that further puts a strain on access to the latest information. However, we can use HINARI

that was established by the WHO (together with major publishers) to gain access to one of the world's largest collections of biomedical and health literature (only for low- and middle-income countries). We can also work via our societies connection like PHYSOCS and AAPS.

Q In terms of collaborations with other African countries, what is the scenario at present? Are there particular collaborations you envisage to engage with in the future? What do you think would be of major benefit to your research environment, in terms of e.g. student exchange, skills training, human capacity development etc?

A As the president of the AAPS I am of the opinion that it is essential to cultivate and promote working relationships between African countries. This is especially important in biomedical research – and Physiology top of the list - as many health problems are in fact shared by several African countries and therefore may have similar risk factors. However, at the moment there is limited communication across the continent and perhaps only between a couple of countries.

Q In terms of Physiology in Africa, what do you think are from your perspective the needs to enable a joint, strong force of Physiological Sciences that is thriving from one continent. What do you think are the needs and the requirements to accelerate that process ?

A This is extremely important for all of us. Collaboration in research and teaching is needed particularly with more advanced countries like South Africa and I hope my attendance at the PSSA congress will stimulate discussion and interaction between us. This is a great start of a conversation and I would like to see us building on this momentum to really strengthen Physiology as a discipline in Africa and also lead to greater cooperation and exchange between our institutions.

Q On a personal note, what do you enjoy doing, engaging with in your free time, any particular likes, dislikes, what you do with great excitement?

A Sitting quietly and reading the holy Qur'an, or an interesting novel!



Across the border: Physiological Sciences on the continent – the Nigerian experience

Good day Prof. Mojiminiyi and thanks for making time for this interview.

Q You are currently employed as head of the Department of Physiology at the Usman Danfodio University in Nigeria. What are your research interests, what are the focus points and what type of techniques are you using for answering the questions in your research environment?



A My research interests are eclectic, determined largely by the questions encountered in my immediate environment and the tools available to answer them. Sadly, until very recently, those tools have been very scarce and few. Generally, my interests revolve around the cardiovascular and blood systems. However, we've had forays into the respiratory and renal systems too. For the cardiovascular system, we've focused on the vascular mechanisms of hypertension. We've also attempted to validate the antihypertensive activities of some of the medicinal plants used in the locality and delineate their mechanisms of action. The model of hypertension we've focused on has been the salt-sensitive one. This is because hypertension in black Africa is largely of the salt-sensitive subset due to a genetic subtle renal defect in salt excretion prevalent in the negroid race in Africa and in the diaspora such as African-Americans. I presume hypertension in white Africans is likely not to be salt-dependent as it is not amongst Caucasians.

We also focus on sickle cell disease, a molecular disease of hemoglobin prevalent in black Africans and Africans in the diaspora including African-Americans. Nigeria has the largest population of sickle cell disease patients in the world. We've also tried to focus on developing potential antisickling drugs from herbs prevalent in Africa. The tools we've used are in vitro systems and myography, employing vascular preparations (largely conduit vessels such as the aorta), invasive and non-invasive blood pressure measurements, microscopy, and so on. Due to the lack of equipment we've also tried using simple but very useful tools such as the cold pressor test and hand grip exercises.

Q What are the major research questions and research priority areas in your country? What are the main questions that are being asked? What defines the research landscape in your country at present?

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A I'm not sure if Nigeria as a country has attempted to define her major research questions or priorities. I'm not sure my university has done this either. This is probably because funding agencies are very few and the Government, the major financier of research, has to contend with so many issues and research may not be top among them! I think Nigeria, and probably Africa, should define her research questions and priorities and then drive them through funding. Research questions and priorities are left largely to individual preferences and fancies of scientists.

Having said that, the Physiological Society of Nigeria (PSN) has come close to defining our research priorities by focusing research on physiological mechanisms of major diseases prevalent in the immediate environment such as malaria, sickle cell disease, peptic ulcer, cardiovascular, respiratory and neurological diseases. Research into effects of African herbs on physiological systems (ethnopharmacology) is very popular, especially among younger scientists. Although, I'm not so young, I am guilty of this too! The pre-occupation with ethnopharmacology by our physiologists and other biomedical scientists may be due to poor training/poor exposure and/or paucity of research equipment and infrastructure. Ethnopharmacology may be a line of least resistance being exploited by our scientists to meet the requirements for promotion. Pumping a herbal extract into rats or in vitro preparations is likely to produce one effect or another!!!

Q How is the funding situation in your environment, both for research per se and for student scholarships? Who are the main funding bodies and how competitive is the environment to secure funding?

A The funding situation is very, very poor and this is very sad! Nigeria, based on the human and natural resources available, cannot be described as poor e.g. we sell 2.5 million barrels of crude oil per day! Multiply that by \$100 per barrel and you get an idea of how much money Nigeria generates per day!!! Such mind-boggling wealth has neither translated to robust infrastructure in any sphere of national life including research or scholarships (creating a "funding paradox"). The culture of charities or foundations providing research funding or scholarship for students is yet

to develop or rudimentary at best.

The major funding body, to the best of my knowledge, is TETFUND (Tertiary education fund) Nigeria. TETFUND never tires to tell Nigerians of the humongous amount of funds available, but these funds are largely inaccessible due to incredible bureaucracy. To get any funds, you have to make trips to Abuja, the capital, and lick the boots of officials! Two personal examples: I applied for a travel grant to attend Experimental biology 2014 earlier this year and I am yet to hear re the outcome from TETFUND! Since TETFUND allows only travel grant application for an international conference per year, I therefore couldn't apply for one to attend the PSSA 2014.

Q What type of equipment is available and predominantly used in Physiology research in Nigeria?

A Until very recently, research equipment has been limited. Recently, after a six month industrial action by the academic staff union of Nigerian universities, the federal Government of Nigeria agreed to robust funding and funds made available to purchase research equipment. As a result central research laboratories were built and equipped at my university. One of such centres (for our medical school and teaching hospital) is currently headed by a young star, Ndodo Darlington Nnaemeka. Ndodo Darlington who previously worked at the University of Graz (Austria), Harvard and Yale universities. He heads the newly open Center for Advanced Medical Research and Training that is equipped with next generation genome sequencing facilities and other genomics and transcriptomics platforms. The center is also equipped with a flow cytometer for cell analysis. It has good support in terms of well qualified support staff and it aims to be regional genome sequencing centre for West Africa in the years ahead.

Q What type of equipment would you like to have access to?

A I would like to have access to Danish Myograph 620M multi-channel wire myographs and accessories, cell/tissue culture equipment capable of growing endothelial and vascular smooth muscle cells, telemetry and all accessories for measuring blood



pressure in rats, Langendorff heart perfusion systems with all accessories, chromatography equipment for determining chemical structure of phytochemicals from medicinal plants and animal models such as the spontaneously hypertensive rat, transgenic animals such as transgenic sickle cell disease mice.

Q Are there areas that you have to outsource through collaborations with overseas partners?

A Very much yes! Indeed, for me, the way out of the woods is what I'd like to call "constructive engagement". By that I mean ACTIVE COLLABORATION AND MENTORING of African students and scientists by overseas partners. But constructive engagement could and should probably begin by collaborations and exchanges within Africa. For instance, I visited Wits University a few years ago on a very short visit (about one week) and I was very impressed with what was being done in the laboratories of Professors Gavin Norton and Angela Woodiwiss as well as in Prof Kennedy Erlwanger's laboratory. That visit resulted in a younger Nigerian colleague joining the Wits team for an MSc degree under the joint supervision of Kennedy Erlwanger, Eliton Chivandi and myself. My younger colleague is full of praise for the exposure he got at Wits and there are already positive ripple effects back in our department and university in Sokoto, Nigeria.

The research milieu and culture in South Africa, to the best of my knowledge, equals or least approaches those in Europe/America and other good places. Collaborations, within Africa, between research endowed countries and not-so-well-endowed should therefore be encouraged. We can then suggest models for collaborations between the developed world on one hand and African countries (including South Africa) on the other.

Q In terms of collaborations with other African countries, what is the scenario at present? Are there particular collaborations you envisage to engage with in the future? What do you think would be of major benefit to your research environment, in terms of e.g. student exchanges, skills training, human capacity development and so on?

A The present scenario is good for collaborations. The world is increasingly becoming a global village - an email or phone call away. Transportation has never been better making it possible for all sections of the world to gather in a single place for a conference. But Africa must seize this opportunity and wake up from self pity, throw away every excuse, roll up sleeves and go to the best places in the world and be mentored! Then such persons can bring back the knowledge and build the continent. The Japanese, the Chinese, the Malaysians, Singaporeans, South Koreans and the Indians have done these. We can and we should too!

The particular collaborations I envisage are eclectic. Charity should begin at home-in Africa. The collaboration must begin within Africa, under the auspices of the Association of African Physiological Sciences (AAPS) for example. The leadership of the PSSA must be thanked for making this possible starting from the AAPS meeting in Ismailia Egypt in 2013. Prof Erlwanger, the immediate past President and the current president, Prof Faadiel Essop as well as Prof Prem Gathiram and Prof Saartjie Roux must be thanked for bringing the PSSA into the AAPS. Also the President of the PSN, Prof Eme Osim and other PSN leaders such as Prof Sofola and Prof Ebeigbe must be thanked for bringing the PSN into the AAPS.

With a good working milieu engendered by the AAPS and other African platforms, collaborations will occur spontaneously. And so, following in the heels of the breakthrough in Ismailia, it was a pleasant surprise to get a mail inviting all the council members of the AAPS and the leadership of the various national Physiological societies to the PSSA 2014 meeting! This is unprecedented! Thanks to Prof Faadiel Essop for this brilliant and insightful idea!

We already have some collaboration with Prof Jeremy Ward of King's College London, and Prof Erlwanger of Wits. I'm hoping we'll be able to also collaborate with the groups at Stellenbosch University led by Prof Essop and Dr Ben Loos. I shall be visiting Prof Prem Gathiram as well as Prof Daneel Dietrich at the University of the Western Cape and Prof David Gray of Wits and I envisage that further collaborations may emerge from these.

NEW PHYSIOLOGY JOURNAL LAUNCHED: Call for Submissions

The Journal of the African Association of Physiological Sciences (JAAPS) is a bi-annual official publication of African Association of Physiological Sciences. Both print and online forms are available.



The JAAPS is aimed at dissemination of information on diverse areas of research in Physiological Sciences and to showcase a representative cross-section of research being carried out especially (but not limited to) the African continent. The journal was established in 2012 at the congress of African Association of Physiological Sciences held in Egypt. The maiden issue contained review and original research papers as well as abstracts of proceedings of AAPS congress in Ismailia, Egypt - published in July 2013. The first issue of the second volume is currently in press. The editorial board of the JAAPS is headed by Professor Anthony Ebeigbe, a cardiovascular physiologist, while the assistant/corresponding editors consist of physiologists/ biomedical scientists from the USA, Europe, South America, Asia and Africa. We call upon and strongly encourage our African colleagues to support the JAAPS and help strengthen the discipline of Physiology within our continent. Detailed information about the journal is available at www.jaaps.aapsnet.org.

Professor Anthony Ebeigbe
Editor-in-chief

Q In terms of Physiology in Africa, what do you think are from your perspective the needs to enable a joint, strong force of Physiological Sciences that is thriving from one continent? What do you think are the needs and the requirements to accelerate that process?

A The leadership must work together passionately driven by a vision beyond self or “what is in it for me or my country?” With such an altruistic attitude, the leaders can begin to mentor the younger ones who hopefully will catch the vision and run with it....A case in point: Prof Prem Gathiram has attempted to get Africa to host the IUPS. We lost a chance just before the last IUPS congress in Birmingham because there was some bickering. It’s natural to bicker but at what/whose expense? Doing to the bickering we couldn’t even submit a bid! Who lost? All of

us! He has fired another salvo. He has suggested that Africa make another bid for IUPS 2025 (?!). It is hoped we act fast and ensure that this opportunity does not pass us by again.

Q Lastly, what can we look forward to at the PSSA, will you be presenting a talk, or will may be your students present a poster? What is the research topic that you will be presenting?

A I will be presenting a talk on the mechanisms (rudimentary!) of the blood pressure lowering effect of a popular herbal drink in Nigeria. Dr Kasimu Ghandi Ibrahim, a younger colleague (hinted at above) supervised by Prof Erlwanger, Dr Chivandi and I will be presenting a work on the effect of this herbal drink on developmental programming.



The Challenges of Teaching and Research in Physiology in Nigeria

By Prof Soga Sofola

Department of Physiology, College of Medicine, University of Lagos, Lagos, Nigeria.

(email – oasofola@yahoo.com, ssofola@unilag.edu.ng)

Nigeria has a population of about 170 million people. There are over 110 universities with 26 accredited Colleges of Medicine that teach physiology. The history of teaching of physiology is fairly recent, the earliest being in 1948 at the University of Ibadan, which was then a campus of the University College, London until it became fully fledged in 1954. It was followed, in 1962, by those in Lagos, University of Nigeria Enugu campus, Ife University and Ahmadu Bello University, Zaria, in the northern part. Other universities then followed.

Teaching of physiology has traditionally been domiciled in Medical schools with majority using the traditional face-to-face method due largely to limited resources. This is in contrast to the Republic of South Africa, which we call 'European country located in Africa', which has superb facilities. Our teaching largely utilizes the white board

and overhead/multimedia projectors. Many schools are beginning to incorporate some ICT components for teaching. However the majority has not embraced on-line instructions and assessment methods,

However, we can claim some achievements as several physiologists have been produced by us, numbering over 500. The present membership of the Physiological Society of Nigeria, which was established in 1978, is about 250. In addition, we have contributed to the training of several doctors as well as record modest achievements in training of PhDs. Our universities in Nigeria depend virtually entirely on governmental funding. It is only recently that some universities have tried to charge high tuition fees, but this is being resisted by both students and parents.

Other issues related to teaching challenges include:



Low number of PhD holders and low wages, though getting better.

- Poor lecturer : student ratio, sometimes as low as 1 : 50. The major challenge inherent in this is the tedium of laboratory supervision (large classes) and assessment.
- Outdated textbooks, as a result of the inability to afford the cost of imported textbooks due to high currency conversion rates, resulting from devaluation as well as low purchasing power.
- Limited ICT/ Internet facilities – due to limited penetration and very high cost of broadband access. Most students have to recourse to internet Cafes, with their prohibitive costs.
- Outdated curricula, some running to over 20 years. However, most universities are now upgrading and the Physiological Society of Nigeria is organizing a teaching workshop in October 2014. This follows the last one that was held in 1980!

As for Research, the publication output is low. For example, sub Saharan Africa contributes less than 0.9% to global published work (1). For sub Saharan African publications indexed in PubMed, South Africa produces 41.5%, followed by Nigeria at 16.1% (2). It is therefore not surprising that no Nigerian University ranks in the top 1000 in the world compared with several South African counterparts e.g. Stellenbosch University and the University of Cape Town – the latter two are ranked in the top 500 (3).

The obvious reason for this state of affairs is poor funding and thus less resources for acquiring top equipment for research. This is reflected in the low quality of articles in our journals that publish papers with little or no cellular, sub-cellular or translational mechanisms. However, efforts are being made to improve on the situation, as the Nigerian government under the aegis of the Tertiary Education Trust Fund (TETF) is making available substantial amounts of funding for research - at both doctoral and researcher levels. For example, our laboratory recently received funding to investigate the role of the epithelial sodium channel (ENaC) in hypertensive Nigerians exposed to high dietary salt loading (Dr Elias, PhD thesis, Lagos, 2012) while collaborating with foreign laboratories in Britain and South Africa - for DNA sequencing and identification of genetic polymorphisms; thus a good an example of trans-

national cooperation.

Other challenges relating to research include:

- Heavy teaching load and limited time for research resulting in low PhD production, in addition to in-breeding and inadequate mentoring.
- Outdated equipment and little availability of reagents and consumables which are challenges to productivity and quality work.
- Lack of or limited access to journals – as most of our libraries are deficient both in number and currency of available journals. Thanks in part to Hinari and PubMed!
- Brain drain from Nigeria and others in sub Saharan Africa, causing the depletion of competent hands.

We therefore need to leverage on the superb research facilities in the developed countries. It will also involve the exposure of our staff to research at cellular and sub-cellular levels (including e.g. cell signaling), in line with current trends.

Thus an appeal is being made to the IUPS and other well established organizations and institutions to come to our aid by the provision of sabbatical positions, laboratory facilities and staff exchange in the developed countries as well as South Africa. We also need a mechanism for equipment transfer through donation of 'surplus to requirement' but useful items to our universities, for example, by establishing a 'warehouse' system for donation of equipment and transfer of such to interested laboratories.

Overall these suggestions will enable our physiologists to boost their teaching and research capabilities. It will also assist to arrest the brain drain and make competent and willing researchers to remain in our country and contribute meaningfully to global scientific enterprise.

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