

AMBASSADOR TO AFRICA

DR. SUNDAY AKINTOYE TO CONDUCT RESEARCH AND TEACH AS A FULBRIGHT SCHOLAR TO NIGERIA

FOR SUNDAY AKINTOYE, an Associate Professor in Penn Dental Medicine's Department of Oral Medicine, his recent selection as a Fulbright Scholar to Nigeria is taking him full circle, giving him the opportunity to return to his native country to conduct research and teach where he first began his dental training.

"Over the years at international meetings, I've noticed an underrepresentation of African researchers and students, and the students in particular seem to lack some of the mentoring opportunities that students in the United States enjoy," Akintoye says. "I used to be in their shoes, and am excited to now embark on this fellowship to provide research mentorship for African students."

The Fulbright award will enable him to spend several months of the 2015-2016 academic year in Nigeria, teaching and mentoring students and young faculty members. He is hopeful that his contribution to supporting researchers in Africa doesn't end with his award, but continues through partnerships between Penn Dental Medicine and the University of Lagos, where he began his career and where he will be teaching as part of the fellowship.

PASSION FOR RESEARCH

During dental school in Lagos, Akintoye's interest in research and teaching was sparked. He practiced dentistry after graduation, but knew his opportunities to pursue research to advance the field would be limited unless he trained elsewhere.

"I realized that not only would I gain access to more advanced physical and intellectual resources in the U.S.," he says, "but I also felt that going to the U.S. would be an opportunity to learn, find opportunities to conduct research, and eventually give back in some way to communities in Africa and the dental community in general."

He made the decision to continue his schooling in the U.S., earning a DDS at New York University College of Dentistry, where he also received a master's degree in oral biology. He continued his training with an oral medicine and clinical training residency at the National Institutes of Health's National Institute for Dental and Craniofacial Research (NIDCR/NIH). Following that, in 2003, he joined the standing faculty at Penn Dental Medicine.

At Penn, Akintoye has made breakthroughs in the field of stem cells and bone regeneration. In his three decades of research, he has observed that stem cells in the mandible and maxilla have unique properties — in growth, longevity, and regeneration — that make them ideal for regrowing bone in the orofacial area. Elucidating what factors distinguish these bones, as compared to other bones in the body, could provide clinicians with tools to replace bone lost to cancer, surgery, or trauma.

Yet these characteristics also appear to make the jaw bone susceptible to a particular type of necrosis called osteonecrosis of the jaw, or ONJ, that arises from exposure to antiresorptive drugs such as bisphosphonate, a drug that is extremely effective against



bone cancer and also prescribed to prevent osteoporosis. His work, funded by support from the NIDCR/NIH, is examining how the drug is taken up by the jaw stem cells, how cellular structures act to break it down, and how this process differs between jaw bone and other bones in the body.

“Some investigators have succeeded at treating ONJ both in animal models and in humans by transplanting bone mesenchymal stem cells,” Akintoye says. “We’re interested in understanding what sets the orofacial stem cells apart from others in the hopes of finding a way to prevent ONJ.”

In a similar vein, the jaw is also vulnerable to osteoradionecrosis, a consequence of exposure to radiation therapy, yet another cancer treatment. When radiation is targeted at the head, as it is for cancer of the head and neck, osteoradionecrosis can cause bone to break down, leaving patients in remission with significant morbidities, including disfigurement

ABOVE: Dr. Sunday Akintoye, Associate Professor, Department of Oral Medicine, will spend several months of the 2015-2016 academic year as a Fulbright Scholar to Nigeria.

and tooth loss. Akintoye’s research in this area, supported by the National Cancer Institute, examines how irradiated bone stem cells from the jaw respond differently from those of other areas of the skeleton.

WELL-ROUNDED DENTAL PROFESSIONALS

“Combining my research, teaching, and clinical service has not only been rewarding but also important to my professional development,”

As a Fulbright Scholar to Nigeria, Dr. Akintoye is returning to his native country to conduct research and teach where he first began his dental training.

To accomplish his research goals, Akintoye is a believer in collaboration. His work with Dr. Kathy Boesze-Battaglia, Professor in the Department of Biochemistry at Penn Dental Medicine, has yielded insights on cellular processing of bisphosphonate by jaw bone stem cells. He has also collaborated with Dr. Amit Maity, Professor of Radiation Oncology, and Dr. Stefan Both, an Assistant Professor of Radiation Oncology, both with Penn’s Perelman School of Medicine to develop a rat model of jaw osteonecrosis using a special radiation delivery method customized for small animals. And yet another collaboration with Dr. Ling Qin, Associate Professor of Orthopedic Surgery at Penn Medicine, is exploring targeted drug therapies for jaw osteoradionecrosis.

Akintoye says, “and I hope to help instill this same balance in Nigerian students as part of my Fulbright project.” He notes that an emphasis on clinical care has arisen in many African dental schools out of necessity for practitioners to serve the community, but further strengthening their research skills can be an added benefit to the patients that the dentists-in-training will one day treat.

During his application process, Akintoye reached out to Dr. Tolu Odukoya, Professor and Chair of Oral Pathology and Oral Biology at the University of Lagos dental school, to see if he would be open to Akintoye’s offer of mentorship and teaching to the dental students.

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“He is very supportive,” Akintoye says. “He’s very interested in the opportunity to see how they can build on the research that they’re doing and advance it to a higher level.”

Akintoye’s involvement in dental education and training at the University of Lagos will be many-fold. Since a primary goal will be augmenting the rigor of the Nigerian students’ research training, he will be helping to update the dental school curriculum to incorporate more research training, he’ll serve as an advisor to the senior students as they embark on thesis projects, and he will be teaching a course in research methodologies. The course will encompass everything from identifying research questions and critically evaluating scientific publications to carrying out statistical analyses and presenting the results and conclusions of a study.

Akintoye acknowledges that a major factor holding back progress of African dental students involves limited resources — both physical, in terms of tools and equipment for conducting experiments, as well as intellectual, in terms of access to mentors and journal subscriptions.

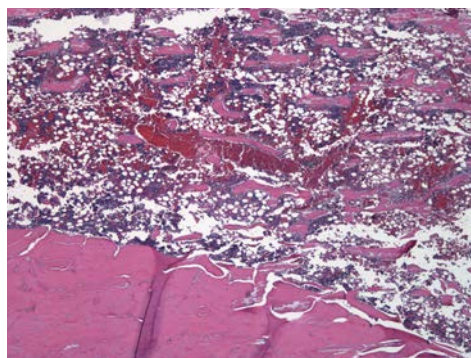
He is hopeful that his stay will make a difference on the mentoring front, though he is less able to improve their access to the latest scientific technology. Nevertheless, he believes, “you can always do something with what you have.”

To that end, he has developed a research project that will be feasible to carry out with the equipment available to the students in Lagos. The investigation will look at the issue of how aging-related changes manifest in teeth, specifically examining changes in key molecular markers in dental pulp, which can be taken from teeth that are being extracted for orthodontic or prosthetic purposes.

“Dental pulp is easy to collect, and you can collect it at different ages,” Akintoye says.

TOP: Dr. Temitope Omolehinwa, a DScD graduate student and research mentee of Dr. Akintoye’s, left, and Research Technician Weihua Li, right, in the Akintoye lab.

LOWER: Histological features of early cellular changes in osteoradionecrosis, showing pronounced cellular transdifferentiation and adipocytic infiltration.



The study will use immunostaining to analyze various molecular markers in the pulp, including indicators of aging and autophagy, a degradation process in which the cell digests itself to eliminate damaged cellular components and recycle undamaged ones. Akintoye’s hypothesis is that autophagy plays an important role in the aging of dental pulp.

In addition, depending on access to a cell-culture facility, Akintoye may also have students get involved in research that involves isolating stem cells from dental pulp.

Beyond the benefit of the students gaining experience in evidence-based dentistry, Akintoye says that conducting research on African populations adds an element to the field of dental science that is somewhat lacking.

“There is a lot of work to be done in these geographical regions based on cultural and ethnic differences in disease and treatment,”

“It is my hope that this project will act as a bridge to bring American and Nigerian cultures together for the betterment of tomorrow.”

— DR. SUNDAY AKINTOYE

he says. “The more that is done, the more we can help the local dental patient population.”

Even when Akintoye’s fellowship year comes to an end, he aims to put in place partnerships and programs that will allow the exchange between the U.S. and Nigeria, and Penn and the University of Lagos, to continue. Already he has decided to collaborate with Dr. Odukoya on ongoing work. He would also like to establish an exchange program whereby students from Penn can visit Lagos and vice versa, ensuring an ongoing cultural and intellectual benefit to both universities.

“It is my hope,” he says, “that this project will act as a bridge to bring American and Nigerian cultures together for the betterment of tomorrow.” ■

— By Katherine Unger-Baillie