PNG Med J 2013 Mar-Jun;56(1-2):43-49

Mother's love for bacterial babies: the commitment of Audrey Michael, Mition Yoannes and Tilda Orami to medical research

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SUMMARY

Audrey Michael, Mition Yoannes and Tilda Orami are long-term health researchers at the Papua New Guinea Institute of Medical Research (PNGIMR). Face-to-face interviews were conducted with all three women for the purpose of profiling women who are leaders in health and medicine in Papua New Guinea. They were asked questions about their early life and childhood, education, work life and training, and mentors who have supported their career path and leadership role. Audrey, Mition and Tilda have all made significant contributions to the PNGIMR and to the health of the people of PNG. In particular, all three have been part of pneumococcal conjugate vaccine (PCV) studies – looking at the safety, immunogenicity and priming for immunological memory of a 7-valent PCV and investigating the safety and immune responses to two different, recently licensed types of PCV, a 13-valent and a 10-valent vaccine.

Working away in the bacteriology and immunology laboratories at the Papua New Guinea Institute of Medical Research (PNGIMR) are three dedicated, strong women. Between them, they have spent more than six decades at the Institute working on a range of infectious diseases from pneumonia to typhoid fever to HIV infection. They have all made significant contributions to recent pneumococcal conjugate vaccine (PCV) studies.

Audrey Michael, or Mama Audrey as she is affectionately known, is the matriarch of the laboratory (Figure 1). Other researchers consider her a mentor, having been trained by Audrey in the basics of bacteriology and laboratory techniques. Mition Yoannes and Tilda Orami (previously Tilda Wal) are two of those researchers.

But Audrey says she only became a medical researcher by accident. As a child, she wanted to be a doctor but physics wasn't a strong point so she decided to study pathology and later medical laboratory techniques.

Audrey hails from Wamira village in the Milne Bay area of PNG, at the south-eastern tip of the island known as the Bird's Tail Peninsula. She completed her training in Port Moresby as a medical laboratory technologist, then spent six months working in Lae, before heading into the highlands in 1985 to work at the PNGIMR in Goroka.

It is a similar tale for Mition and Tilda. Both completed their laboratory technician training at the College of Allied Health Sciences in Port Moresby about a decade after Audrey.

Mition (Figure 2) is from Wabag, Enga Province, and says she never thought she would be a researcher. She had dreams of becoming a typist after watching a woman typing in the school office and noticing she had 'good hands'. She ended up in Goroka after seeing PNGIMR mentioned on the noticeboard at the Port Moresby General Hospital pathology department. She wrote

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Figure 1. Audrey Michael in the bacteriology laboratory at the Papua New Guinea Institute of Medical Research.

Figure 2. Mition Yoannes in the bacteriology laboratory at the Papua New Guinea Institute of Medical Research.

a letter which ended up in the hands of PNGIMR Director Professor Michael Alpers, who offered her a job in microbiology.

Tilda (Figure 3) had even fewer aspirations for her working career. She says she had no interests and after finishing college was just hanging around in her home village of Aiyura near Kainantu in Eastern Highlands Province. But she did know Mition from school and thought her work looked interesting and exciting so she followed in her footsteps.

Figure 3. Tilda Orami in the immunology laboratory at the Papua New Guinea Institute of Medical Research.

Tilda's training took longer than expected with a two-year wait due to a lack of lecturers. In that time, she had a baby and found it difficult to go back to school. Her career got back on track when she moved to Goroka to take up a position in the bacteriology laboratory at PNGIMR. Tilda says it gave her the opportunity to learn many new things and travel. She attended a three-week course in the Philippines on HIV/AIDS (human immunodeficiency virus/acquired immune deficiency syndrome) and co-infections in Asian and Pacific countries.

Audrey and Mition have also gained new skills and techniques overseas. Both have been to the Philippines – Mition learned about culturing and identification of bacteria and viruses during a training course while Audrey spent a month at the Research Institute for Tropical Medicine in Manila as a lab technician. Audrey says it was 'such a long time ago' but that it was an exciting time with lots of doctors and professors to learn from. She is grateful for the opportunity to gain training – she says in the early days of her career training was difficult to access and it was very expensive to go overseas.

All three have visited Australia. Audrey spent eight weeks at the Queensland Institute of Medical Research learning how to serotype pneumococci and test for antibiotic resistance. She enjoyed the course. It was taught by the same teacher as in the certificate course she completed in Port Moresby.

Mition has been 'down under' several times – a visit to the Menzies School of Health Research in Darwin to learn quantitative polymerase chain reaction (PCR) techniques, and to Perth's Telethon Institute for Child Health Research and PathWest for training on a machine used to identify bacteria. Mition has also been to Melbourne to learn PCR and other molecular and microbiological techniques.

It is Tilda who has spent the most time in Australia. After completing a bachelor's degree in laboratory science in 2009, Tilda embarked on an honours degree and at the end of 2012 she travelled to the Telethon Institute to spend three months measuring salivary antibodies in the lab for her honours, and brought her 420 samples to Perth after waiting 12 months for reagents that never arrived in Goroka. Tilda worked in the Institute's labs and brought her results and newly acquired Bioplex techniques back to PNG. She says she did lots of work while in Western Australia, with very little time for sightseeing, but she did enjoy heading

to the south-west town of Denmark with its beautiful trees and beaches.

The trio have been part of the two PCV studies that have been running from the PNGIMR clinics since 2005. Both studies are collaborative projects between PNGIMR, the Telethon Institute for Child Health Research and the School of Paediatrics and Child Health in the University of Western Australia. The first study ran for four years looking at the safety, immunogenicity and priming for immunological memory of a 7-valent pneumococcal conjugate vaccine to find out whether neonatal immunization in the first week of life would provide earlier protective antibody responses than immunization starting a month later, which is the standard schedule in PNG.

Important results came from this study of 318 children, including that the vaccine had no negative effects and was immunogenic in neonates and young babies. The data showed that 60% of infants were colonized with *Streptococcus pneumoniae* by one month of age, with 51 different pneumococcal serotypes identified in the upper respiratory tract. The vaccine had limited overall impact on upper respiratory tract carriage in this population. However, the level of protective antibodies achieved by the vaccine was high and giving the 23-valent pneumococcal polysaccharide vaccine at nine months of age should provide even better and broader protection against diseases caused by the pneumococcus than PCV alone.

It was these children that provided the saliva samples analysed by Tilda for her honours project, allowing her to optimize and measure mucosal immunoglobulin (Ig) A and IgG antibodies. She hopes to submit her thesis within the coming year.

The current PCV study is looking at the safety of and immune responses to two different types of pneumococcal conjugate vaccine – the 13-valent Prevenar 13 and the 10-valent Synflorix. In the near future, the government of PNG will roll out a nationwide vaccination program of Prevenar 13 in children. Results from this current study will inform the government that if and when supplies of Prevenar 13 run out, due to world demand, it can be interchanged with Synflorix and still provide strong protection against pneumococcal disease.

In this study, 200 children have already been enrolled, with half receiving Synflorix and half Prevenar 13. Nasal swabs and blood samples are collected from each child and sent to the lab for analysis. Audrey's role in the study is to culture the bacteria from the samples and identify which bacteria are present – especially *Streptococcus pneumoniae* and *Haemophilus influenzae*. Once cultured and coded, the data are passed to Mition, who enters all the information into the database. Mition calls the bacteria their 'bacto babies' and they work hard to keep them alive all the time, putting them to sleep in -80˚Celsius freezers so that research studies can continue.

This research is of vital importance to PNG as pneumonia (commonly caused by the pneumococcus) is the main reason children are admitted to hospital or die. Audrey says seeing vaccines work is one of the most rewarding parts of her job. Mition agrees and says she is proud to have contributed to improving the health of the people of PNG by being part of research that provides important information to government and policy-makers. All can feel proud to have worked on the PCV studies and look forward to seeing a vaccine introduced to protect the children of PNG.

It is not just pneumococcal studies that these women have been involved in. Among other studies, Audrey has been part of research into osteomyelitis, a bone disease common in the highlands of PNG. She was looking at blood, bone and pus to identify the bacteria responsible for causing the disease.

Mition has worked on a meningitis surveillance study, with daily processing of cerebrospinal fluid to culture and identify bacteria, as well as an HIV surveillance study. She has also looked at antibiotic resistance in *Neisseria gonorrhoeae* in a gonorrhoea study, a typhoid study to determine the age- and sex-specific incidence of typhoid fever in the Eastern Highlands, and a postpartum sepsis study which showed high rates of genital mycoplasma infection in women giving birth at Goroka General Hospital.

Both Tilda and Mition were involved with the sexually transmitted infection (STI) and HIV surveillance project, travelled with the team to the study sites and collected, processed and transported samples back to the lab. They then tested the serum samples for HIV and syphilis. Audrey, Tilda and Mition

all have a strong work ethic, which often sees them starting work early, working back in the evenings or coming into the lab on weekends. But they all love their jobs and they all agree that the PNGIMR is a great place to work, with a good family atmosphere and colleagues who help each other.

For a woman working in research, it can be tough at times. Juggling a full workload, caring for children, running a household and contributing to the community means there is little time left for themselves. Nevertheless, with lots of fellow women researchers at PNGIMR, Tilda says they can support each other both in the lab and outside of work as friends. They all credit their families with being supportive and understanding of the demands of their jobs. Audrey says her parents encouraged her to pursue her career in Goroka despite them being afraid of 'highlands people'. She has since brought them to Goroka on a visit.

Audrey, Tilda and Mition all have children; Audrey has a grandson too. Tilda cares full-time for three children, aged 10, 12 and 13. She says none of them have aspirations to follow in her footsteps and work in health research, but her youngest does help pack pipette tips into boxes for use in the lab. Along with their supportive families, there have been many mentors in their careers. Mition and Tilda both name Audrey as a significant personal and professional mentor, someone who willingly teaches others and passes on her knowledge. She's also a 'wonderful person'. Mition says microbiologists Alison Clegg and Tony Lupiwa taught her valuable laboratory skills at a time when she did not have much knowledge and understanding about the day-to-day procedures of a research laboratory. Tilda also credits Tony as an understanding and helpful mentor and her current boss Dr William Pomat, head of the PNGIMR infection and immunity section, for encouraging her to go back to school and complete her degrees. For Audrey, New Zealander Mike Gratten has been a strong influence since she met him at Port Moresby General Hospital early in her career; he subsequently came to work at PNGIMR. She says Mike had a lot of patience for her, insisting there were no silly questions, and sharing those experiences which cannot be found in a textbook.

While Audrey, Tilda and Mition are still found working at the bench, they are also training the next generation of researchers, teaching them the basics of bacteriology, media making and how to freeze-dry bacterial isolates for long-term preservation. Audrey is at the end of her career at the PNGIMR but hopes to continue working in health as a consultant in bacteriology, especially in training and the establishment of laboratories. She is also keen to set up a program to get women together to teach them how to look after their own health. On a personal level, she hopes to travel to see all the people she has met over the years. But her big dream is to be a florist – she has already completed a floristry course – to grow flowers in her garden to sell, and have a park full of blooms where people can rest and enjoy a barbeque.

Tilda's future plans include going back to school. She would like to start a master's degree soon and says that a PhD could be a possibility further down the track. Mition also has studies on her mind, hoping to start a bachelor's degree before long. She also wants to do something to stop her fellow countrywomen dying of cervical cancer. According to Associate Professor Andrew Vallely, deputy director of science at PNGIMR, cervical cancer kills 1500 Papua New Guinean women a year, more than any other cancer, and PNG has one of the highest rates in the world. Mition sometimes talks to women in church gatherings to inform them about tests and facilities now available in PNG to detect cervical cancer. She says she would not hesitate to learn how to read Pap smears for the diagnosis of cervical cancer if given the opportunity. Currently, Pap smears are sent overseas and it takes a while for the results to come back to PNG.

Audrey, Tilda and Mition have helped shape the PNGIMR into the bustling and productive research facility that it is today. Through hard work, passion and a determination to make a difference to the health of their people, this trio are shining examples of women making valuable contributions to health and medical research in the challenging environment that is Papua New Guinea.

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