Published: March 2018

What can we do about tuberculosis?

Brian Williams - Epidemiologist affiliated to SACEMA.

About seventy thousand years ago our species, *Homo sapiens sapiens*, left Africa to colonize the world but coming with us on our journey was *Mycobacterium tuberculosis* or TB; we have lived and evolved with TB for as long as we have been on this earth (1) and have developed an uneasy relationship with the pathogen.

TB can be fatal. At the end of the 19th century TB was the single biggest killer of people in Europe and remains one of the greatest causes of mortality worldwide. But TB persists because we have developed a degree of immunity which enables TB to remain in a latent state in otherwise healthy people for decades before it is passed on and there are populations in the Western Cape where close to everyone aged 20 years or more has a latent TB infection. So the eradication of TB is difficult. Incidence rates even in quite badly affected populations may only be of the order of a few hundred cases per hundred thousand people per year; to find one case you may need to test a thousand people. And detecting active TB is still difficult. Using microscopes we can look for bacteria in a sputum sample. We can grow the bacteria in culture and then test for resistance. Molecular tests are becoming more widely available but we still do not have a simple, cheap, point-of-care test for TB disease. To make matters worse, treatment requires at least six months and even then a cure is not certain. In South Africa the risk of TB is increased even further. The millions of migrant men who worked on the mines are very likely to have silicosis by breathing in the silica in the dust when they dig and drill for gold which increases their risk of developing TB. The migrant labour in our region then ensures that the infection will spread. To add to that, South Africa has the worst epidemic of HIV in world and being HIV-positive further increases a person's risk of developing TB.

Controlling and eliminating TB is never going to be easy and this issue of the SACEMA Quarterly is devoted to some of the recent developments that have been made in our attempts to manage TB. Alex Welte, Elisabetta Walters and Robert Gie discuss some of the reasons that make the diagnosis of TB so difficult using the old, established diagnostic tools. They consider the potential of the new molecular test, gene-Xpert, which offers great promise but still faces significant problems and they discuss the further problem of knowing when a person is truly cured.

Cari van Schalkwyk and Mareli Claassen consider the critical problem of improving case finding for TB. Given the low prevalence and incidence of TB one needs to be strategic in the search strategies. Traditionally various signs and symptoms that are suggestive of TB have been used including persistent cough, sudden weight loss, night sweats and so on, but many people who have these symptoms might well ignore them until it is too late. Van Schalkwyk and Claassen stress the need for developing much more efficient case finding techniques and suggest ways in which this might be done.

Florian Marx and Grant Theron continue the discussion and focus on four main categories of interventions. First, enhancing TB case finding in people who have not yet accessed health care and secondly in people who are actively seeking health care. The third strategy involves active TB case finding in high-risk groups and then with a focus on anyone who is infected with HIV. Finally, they discuss the critical need to develop and implement better TB diagnostic tests and algorithms.

People infected with HIV are at much greater risk of developing TB than people who are not. Between 1995 and 2004 the epidemic of HIV in South Africa led to an increase in the incidence of TB from 100 to 500 cases per 100 000 (100k) people per year. Fortunately, anti-retroviral therapy (ART) for HIV also reduces the risk of developing TB by about 60% and this has bought the rate down to about 250 cases per 100k people per year. Elizabeth Corbett was the first to show that the dramatic rise in incidence has not been matched with a rise in prevalence because people with HIV who are not on ART will either die from TB or seek treatment much earlier in the course of their infection. This means that the epidemic of TB in HIV-positive people does not significantly affect the epidemic in HIV-negative people. Brian Williams uses this to show how the joint epidemics of HIV and TB can most easily be modelled. While the challenge of managing TB in HIV-negative people remains is is unaffected by the epidemic in HIV-positive people, and to manage TB in HIV-positive people it is of the greatest importance to start ART as soon as possible after infection with HIV.

Brian Williams *- Epidemiologist affiliated to SACEMA. Area of research interest: mathematical biology.* williamsbg@me.com

Reference:

Dye C. The Population Biology of Tuberculosis: Monographs in Population Biology, Princeton University Press; 2015.
This book covers all of the important epidemiological, biological and mathematical aspects of tuberculosis.