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Clinical application of detection rats in the diagnosis of tuberculosis in key populations

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Background: Tuberculosis disease kills about 1.7 million people worldwide with many deaths occurring in developing countries in south East Asia and Sub Saharan Africa. Children and people living with HIV/AIDS are among key population that STOPTB initiatives aim to enhance TB diagnosis because they contribute significantly to TB burden and they are prone to TB disease because it is difficult to diagnose TB. In countries with high HIV/AIDS prevalence the sensitivity of otherwise sensitive tests may be compromised. We report on clinical application of trained TB detection rats in clinical sputum samples from people living with HIV/AIDS and children.

Methods: Presumptive TB patients produced two sputum samples for TB diagnosis in hospitals and second-line testing by rats. Samples indicated by rats as TB positive were confirmed by concentratedsmear microscopy and bacterial load estimated following guideline/score of the WHO and IUATLD. Sputum from a general presumptive TB population was cultured in 5 different media to determine the various microbes and whether rats could differentiate sputum with *M. tuberculosis* from those with other microbes.

Results: A total of 1,906 PLWHA and 4629 of children within age 1-14 were tested. Conventional TB tests detected 60 adult PLWHA and 331 children whereas rats detected 156 PLWHA and 539 children respectively. Over 50 percent of the patients detected by rats missed by hospitals had low *Bacilli* count insputum sample. Application of molecular PCR based confirmation tests showed that missed samples detected by rats' contained *Mycobacterium tuberculosis*, the pathogen causing TB. Furthermore, rats differentiated sputum containing *M. tuberculosis* from those with nontuberculous mycobacteria and mycobacteria related *Nocardia* and *Rhodococcus* species that are also acid-fast *Bacilli* often mistaken with TB by microscopy.

Conclusion: Trained TB detection rats have potential for clinical application in detecting TB that could have been missed by conventional TB tests in TB/HIV high-TB burden countries where the diagnosis is still a challenge due to smear negativity that increases in TB/HIV co-infection.

Speaker Biography

Georgies Mgode is a research fellow at Pest Management Centre, Sokoine University of Agriculture (SPMC) heading the vector-borne and zoonotic disease studies section; and is the program manager of APOPO TB involved with novel diagnosis of pulmonary tuberculosis (TB) using trained African giant pouched rats (*Cricetomys* sp. Swahili: Panyabuku). He has research interest in tuberculosis and rodent borne zoonotic diseases including leptospirosis. He is among the pioneer researchers of tuberculosis detection using rats and he explored the specific odour compounds (volatile organic compounds) of *Mycobacterium tuberculosis* which are targeted by TB detection rats for doctoral degree studies at the Max Planck Institute for Infection Biology (MPIIB), in Berlin, Germany.

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