

SCIENTIFIC TALK

Aerosol sampling in pulmonary TB and other respiratory infections

Date : 5th July 2018 (Thursday)

Time : 2.00 pm

Venue : DDK1, Faculty of Science, UTAR, Kampar Campus

Biography

- Professor of Clinical Microbiology and Honorary Consultant Microbiologist, University of Leicester, UK
- He graduated in medicine and immunology from University College London then undertook postgraduate training at the London School of Hygiene and Tropical Medicine before taking up a faculty position at the University of Newcastle upon Tyne where he completed Fellowship of the Royal College of Pathologists.
- His research background is in the interface between bacterial physiology and human infection and current research focus is on the microbiology of the lower respiratory tract, predominantly Tuberculosis and Microbiomic studies.
- His work is currently funded by the UK Medical Research Council and the Wellcome Trust.

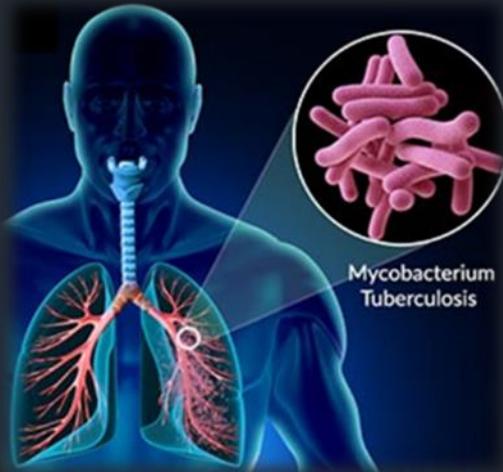
Research interests

- He has worked extensively on the understanding and assessment of bacterial viability with application to medical and public health practice. His group first demonstrated the transcriptional patterns of Mtb in human sputum and the abundant presence of differentially culturable (non-colony-forming) Mtb in these samples. These “Fat and Lazy persister-like bacilli” first alerted us to the specific properties of tubercle bacilli in expectorated material and early evidence indicates that their abundance is correlated with responses to treatment.



Professor Mike Barer

Abstract



We have been investigating the aerosol phase in the life cycle of Mycobacterium tuberculosis (Mtb). Transmission of this obligate pathogen, which currently infects more than 25% of humanity, depends on aerosols generated within the respiratory tracts of infected individuals. Preventing transmission could make a major contribution to tuberculosis control. The infectivity of Mtb aerosols was established by Riley and Wells in the 1950s by passing the extract air from TB patient-containing rooms over guinea pig colonies. More recently Fennelly and colleagues have established the cough aerosol sampling system (CASS) to assess individual patient infectivity in a standardized fashion. Their studies show strong correlation between cough-generated Mtb colony counts and household transmission rates. A striking feature of their results was lack of correlation with sputum bacterial loads in the same patients.

We have established **a programme of aerosol studies directed to understanding the properties of Mtb essential to its aerosol transmission.** We have used CASS sampling **to determine gene expression of the organism in aerosol and compared this to that detected in contemporaneous sputum samples.** We have also **established the use of face masks to sample aerosols** produced under more natural circumstances. While CASS results provide a validated method that can be related to published transmission studies, the equipment requirements are significant and results take up to 6 weeks for the bacterial culture. In contrast, the mask aerosol sampling system (MASS) has minimal equipment requirements, is low cost and can be applied in resource limited community settings. Our CASS results provide evidence that the transcriptional activity of Mtb in aerosol is distinct from that of the same organism in patient sputum. Moreover, the associated microbiota in aerosol and sputum show distinct patterns. Our MASS results provide insight into Mtb-contaminated aerosol production by patients over 24 hour sampling periods. Sputum Xpert MTB/RIF positive patients showed 3 distinct patterns of aerosol production, negative, modest (103-106 genomes per hour) or variable. The variable group produced the greatest output over 24 hours. Bacterial genome counts in sputum over 24 hours did not correlate with the aerosol counts. These results add weight to the view that the patient generated TB aerosol is not a simple sample of their sputum and provide further incentive to explore methods for aerosol sampling in TB and other infections compatible with routine clinical practice.