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Inside

Article

Tuberculosis Control:
Current Status and Challenges

Publications

Conference/Workshop/ Meetings attended

Workshop/Training/ Meetings conducted

Events

Foundation of Hostel

Hindi Fortnight Celebrations

Farewell

Visits

Establishment of new Labs.

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TUBERCULOSIS CONTROL: CURRENT STATUS AND CHALLENGES

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Tuberculosis (TB) is a major public health problem and its control has become a challenge in a developing country like India. It is the largest single cause of adult illness and death from a communicable disease in the country. Over 2 million people die of tuberculosis worldwide each year, around 400,000 of them in India alone. It is estimated that every three minutes two deaths occur due to TB in the country. TB represents 3.7 percent of India's disease burden, 11 times that of malaria, and is the leading cause of death in the 15 to 45 year age group. Its greatest impact is on the poor.

It is an infectious disease caused by *Mycobacterium tuberculosis*. It is spread through the air by a person suffering from TB. A single patient can infect 10 or more people in a year. Patients with pulmonary tuberculosis (PTB) are the most important source of infection. They present with a chronic productive cough, fever, and weight loss. Tubercle bacilli are spread into the air by coughing, spitting etc. Infection occurs by inhaling infectious particles of respiratory secretions containing tubercle bacilli. The diagnosis of PTB is based on sputum smear microscopy and chest radiography and culture where laboratory facilities are available. The diagnosis of PTB in children is difficult because they rarely produce sputum for smear examination. Diagnosis therefore usually requires a combination of clinical features, history of contact with a sputum-positive case, growth faltering, chest X-ray, and tuberculin skin test. Tuberculin survey using skin test and the computed annual risk of tuberculosis infection (ARTI) are indicators to assess the extent of transmission of infection with *Mycobacterium tuberculosis* in a community and trends over relatively long period of time. Significant improvement in understanding of molecular biology of *Mycobacterium tuberculosis* has led to development of newer diagnostic techniques of

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tuberculosis. Polymerase chain reaction (PCR) is an emerging diagnostic tool for diagnosis of TB in children. However, its role in day-to-day clinical practice needs to be defined. A negative PCR never eliminates possibility of tuberculosis, and a positive result is not always confirmatory. In the absence of good diagnostic methods for tuberculosis, a lot of interest has been generated in serodiagnosis. ELISA has been used to detect antibodies to various purified or complex antigens of M. tuberculosis in children. It is rapid and does not require specimen from the site of disease. The serological tests, theoretically, may not be able to differentiate between infection and disease. A new test (Quanti FERON-TB or QFT) that measures the release of interferon-gamma in whole blood in response to stimulation by purified protein derivative is comparable with the tuberculin skin testing to detect latent tubercular infection, and is less affected by BCG vaccination. Polymerase chain reaction may help in early identification of drug resistance in mycobacterium.

The information of the current epidemiological situation is required to plan the effective control strategies. There is, however, paucity of this information in the country. The first ever National Sample Survey of TB conducted by ICMR in 1955-58 revealed that the prevalence of sputum positive pulmonary TB is about 4 per 1000 population and an estimated 1.5 million infectious cases spreading infection in the community. Another Nation-wide survey in 2000-03 studied the prevalence of infection and ARTI in different parts of the country. ARTI has been found to be ranging between1.0 % to 1.9 % in different zones of the country. ARTI expresses the overall impact of the prevalent infectious cases in the community and the efficiency of disease control measures. ARTI estimates also enable us to calculate the extent to which cases may emerge in the future. The information on tuberculosis situation in tribal population is lacking except few studies conducted in various pockets. RMRCT had conducted a study in Saharia tribe in 1991. A high prevalence of 12.7 per 1000 population was observed among them. The infection rate was 16.9%. Similar study conducted in isolated tribal population of Car Nicobar islands showed a tuberculosis prevalence of 7.3 per 1000 and infection rate of 16.4%. Another study conducted in Jawadhu hills tribe of Tamil Nadu showed a disease prevalence of 8.6/1000and infection rate of 6.1%. In view of the paucity of data from tribal population, the centre has initiated a study to understand the tuberculosis situation among tribal population of Madhya Pradesh. The prevalence of infection has been found to be 6.8% and the computed ARTI 1.3% among tribal children of the state. The results of the recently concluded disease survey are awaited. The drug susceptibility pattern of tubercle bacilli is expected to provide, for the first time, valuable information on the drug susceptibility pattern among tribal population of the state.

TB continues to be a major public health problem despite the implementation of the National Tuberculosis Control Program since 1962. In 1992, Govt. of India established a Revised National Tuberculosis Control Program (RNTCP) using the directly observed treatment, short-course (DOTS) strategy recommended by the World Health Organization (WHO). The DOTS strategy consists of sustained government commitment, effective laboratory-based diagnosis, standard treatment given under direct observation, secure drug supply, and systematic monitoring and evaluation. RNTCP was implemented in pilot areas beginning in 1993; large-scale implementation of the program began in late 1998. RNTCP has implemented DOTS rapidly and has yielded positive results in TB control raising hopes of controlling TB in the country. The key to success lies in the link between basic science and public health. The other challenges also need to be addressed viz. emergence of drug resistance and HIVTB Co-infection.

Resistance to anti-tuberculosis drugs (MDR-TB, XDR-TB)

Multidrug resistance (MDR-TB) is expected to occur whenever patients fails to take a complete course of anti-TB chemotherapy. MDR-TB refers to strains of the bacterium which are proven in a laboratory to be resistant to the two most active anti-TB drugs, isoniazid and rifampicin. MDRTB is a tragedy for individual patients and a symptom of poor TB management. An assessment of the number and distribution of drug-resistant TB cases is important for planning TB control, because the treatment of resistant cases is more costly and more complex if second-line drugs are used, and failures and deaths are more frequent. In several surveyed areas of India, 1.0%-3.3% of new TB patients have MDR-TB. With an average of 2% of new patients having MDR-TB, there will be an estimated 20,000 new infectious cases of MDR-TB in India every year. Extensively Drug-resistant TB (XDR-TB) is another worrying issue as the patients do not respond to standard drug treatment.

HIV-TB Co-infection

TB is the most common opportunistic infection in people living with HIV virus. As the HIV breaks down the immune system, HIV- infected people are at greatly increased risk of TB. HIV is also the most powerful risk factor for progression from TB infection to TB disease. TB in turn accelerates the progression of HIV to AIDS and shortens the survival of patients with HIV infection. Thus, TB and HIV are closely interlinked. In India there are an estimated over 5 million HIV-infected persons. With such large numbers of HIV-positive individuals in India, it is likely that HIV may worsen the TB situation in the country.

The World Health Organization (WHO) declared tuberculosis a global emergency in 1993. In view of the increasing threat, a new strategy was launched in 2006 by WHO - "Stop TB Strategy". The new "Stop TB Strategy" addresses the current challenges facing countries in responding to TB including HIV - TB co-infection and MDR-TB. The Govt. of India, in the second phase of RNTCP, has incorporated all the components of new Stop TB strategy. India is also committed to achieve the millennium development goal (MDG) of halting the spread of TB by 2015.

Acknowledgement

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Dr. V. G. Rao
Deputy Director (Community Medicine)

Publications

1. Vinayak S, Alam MT, Upadhyay M, Das MK, Dev V, Singh N, Dash AP, Sharma YD. 2007, Extensive Genetic Diversity in the Plasmodium falciparum Na+/H+ Exchanger-1 Transporter Protein Implicated in Quinine Resistance. Antimicrobagents chemother. 51: 4508-4511.
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3. Anvikar AR, Dolla CK, Dutta S, Rao VG, Gadge V, Shukla GP, Rao S, Karforma C. 2007. Role of Diarrheagenic Escherichia Coli in Acute Dirrhoea of Tribal Preschool Children of Central India. Paediatric and Perinatal Epidemiology, 22: 40-46.
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7. Sharma RK, Kumar Ashok. 2007. District level analysis of reproductive health status in Madhya Pradesh. Proceedings of Bhopal Seminar (accepted).

Conference/Workshop/ Meetings attended

1. Dr. Neeru Singh

- Attended malaria workshop at Visakhapattanam on 15th to 17th May 2007 and delivered a lecture on "Rapid diagnostic test in malaria".
- Attended meeting on Chikungunya at Delhi on 29th May 2007.
- Attended meeting regarding "Vaccine project" at ICMR Delhi on 11th & 12th June 2007.
- Attended a workshop on "Intensive Action Plan of NVBDCP to Control Falciparum malaria in endemic districts" held on 2nd July 2007 at NICD hall Delhi and presented the reports of field visit in 3 districts monitored by NIMR officers
- Attended the meeting on Chikungunya with district health officials at Katni on 30th August 2007.
- Attended expert group meeting on the project "Preparation of a field site for malaria vaccine trial in and around Jabalpur" on 8th & 9th September 2007 at Pachmarhi.
- Attended meeting regarding "NICHD/India collaborations: Accomplishments and future opportunities" at New Delhi on 19th September 2007.
- Attended 9th Indo-US joint working group (JWG) meeting on contraceptive and reproductive health research (CRHR) at New Delhi on 20th & 21st September 2007.

2. Dr. T. Chakma

- Attended Integrated Disease Surveillance Programme on non communicable disease trainers training programme at ICMR HQ, New Delhi from 18th to 20th July 2007.

- Attended as resource person the workshop on "Fluorosis mitigation strategy" from 26th to 27th July 2007, organized by National Environmental Engineering Research Institute (NEERI), Nagpur.
- Attended as resource person training programme for grass root level workers of Maharashtra for Integrated Disease Surveillance Programme, Cardiovascular risk assessment survey from 11th to 13th September 2007.
- Attended as resource person "2nd International learning exchange programme" from 19th to 21st September, 2007, at Dhar and Jhabua, organized by UNICEF, Bhopal.
- Attended as resource person the workshop "Prevention and management of Dengue and Chikungunya" for medical officers of Katni district on 25th September 2007.

3. Dr. R. B. Gupta

- Attended expert group meeting on the project "Preparation of a field site for malaria vaccine trial in and around Jabalpur" on 8th & 9th September 2007 at Pachmarhi.

4. Dr. S. R. Qamra

- Attended the training cum workshop "Design, Monitoring and Evaluation of HIV/AIDS" from 19th to 21st September 2007 at New Delhi.

5. Dr. K. B. Saha

- Attended expert group meeting on the project "Preparation of a field site for malaria vaccine trial in and around Jabalpur" on 8th & 9th September 2007 at Pachmarhi.

6. Dr .D. Das

- Attended expert group meeting on the project "Preparation of a field site for malaria vaccine trial in and around Jabalpur" on 8th & 9th September 2007 at Pachmarhi.

7. Dr. Surendra Kumar

- Attended workshop on biostatistics basic principles and regulatory requirements of statistics in clinical research on 16th & 17th June 2007 at Hydrabad.
- Attended Integrated Disease Surveillance Programme on non communicable disease trainers training programme at ICMR HQ, New Delhi from 18th to 20th July 2007.

8. Mr. Dinesh Kumar

- Presented a paper at the conference on "Royal Society of Tropical Medicine and Hygiene a centenary celebration meeting the Millennium Development Goals" at Queen Elizabeth II Conference Center, London, UK from 13th to 15th September 2007.

9. Dr. Jyothi Bhat

- Attended a consulate meeting on MDR/ XDR TB on 14th & 15th September 2007 at Tuberculosis Research Centre, Chennai.

10. Dr. R. K. Sharma

- Attended short term training course on economic basic of health care intervention during 16th to 18th August 2007 at WHO collaborative training centre, Community Health Department, Christian Medical College, Vellore.
- Attended expert group meeting on the project "Preparation of a field site for malaria vaccine trial in and around Jabalpur" on 8th and 9th September 2007 at Pachmarhi.

11. Dr. Arvind Verma

- Presented a paper at the conference on "Royal Society of Tropical Medicine and Hygiene a centenary celebration meeting the Millennium Development Goals" at Queen Elizabeth II Conference Center, London, UK from 13th to 15th September 2007.

Foreign Visits

- **Mr. Dinesh Kumar**, Senior Research Officer
  Royal Society of Tropical Medicine and Hygiene, London, UK, 13th to 15th September 2007.
- **Dr. C.K.Dolla**, Senior Research Officer
  Pursuing MPH course at V.U.University, Amsterdam (September 2007-08).
- **Dr. A. Verma**, Research Assistant
  Royal Society of Tropical Medicine and Hygiene, London, UK, 13th to15th September 2007.

Workshop/Training/Meetings conducted

A workshop was organized by ICMR for administrative staff of RMRCT on 22nd May 2007. Mr. H.L.Arora, Sr. Administrative Officer and Mr. G.D.Sharma, Sr. Accounts Officer from ICMR H.Q., were the resource persons.



National Institute of Malaria Research Field Station Jabalpur and RMRCT jointly organized a meeting to review the progress of the project entitled, "Preparation of field site for Malaria vaccine trial in and around Jabalpur" on 8th & 9th September 2007. Dr. N.K.Ganguly, Director General, ICMR presided the meeting as special invitee.



Training on HIV/AIDS was organized for laboratory technicians and staff nurses from 11th June to 13th July 2007. Forty five laboratory technicians and fifty four staff nurses were trained.



Centre organized International Services Association(INSA) 41st Community health trainer's training program from 9th to 16th September 2007.



Training imparted to the Medical Officers of District Katni on Dengue and Chickungunya on 25th September 2007.



Events

Foundation Stone

Foundation stone of International Trainee Hostel was laid down by Prof. N.K. Ganguly, Director General, ICMR on 11th August 2007.



Hindi fortnight Celebrations

During this fortnight (1st to 15th September 2007) various competitions were organized at the centre for the employees. The winners of the competitions were presented with cash prizes and certificates by Director of the centre.



Farewell

Dr. Anup R. Anvikar, Assistant Director at the centre joined National Institute of Malaria Research, New Delhi as Assistant Director in June 2007.



Visits

Prof. N.K.Ganguly, Director General, ICMR visited the centre on 11th August 2007 and inaugurated DNA sequencing laboratory.



Mr. Jaideep Govind, IAS, Tribal Commissioner of Madhya Pradesh visited the centre on 18th September 2007 for meeting with scientists of the centre.



Renovation of Laboratory building is in progress



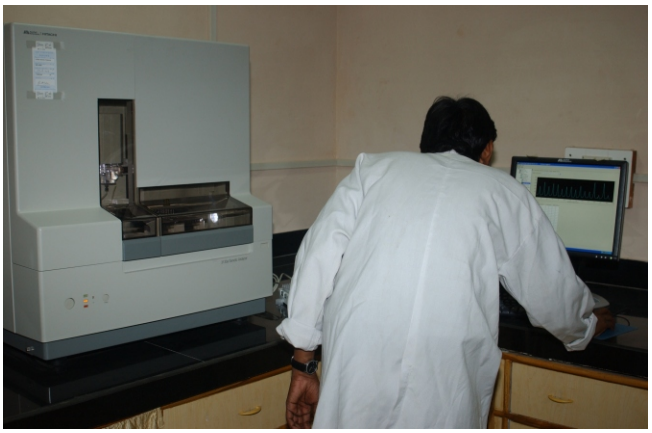


Establishment of New Laboratories

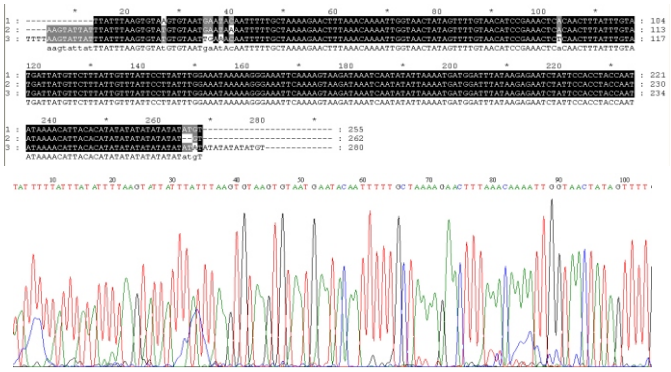
Mycobacteriology laboratory for culture and drug susceptibility testing of mycobacteria



DNA sequencing facility



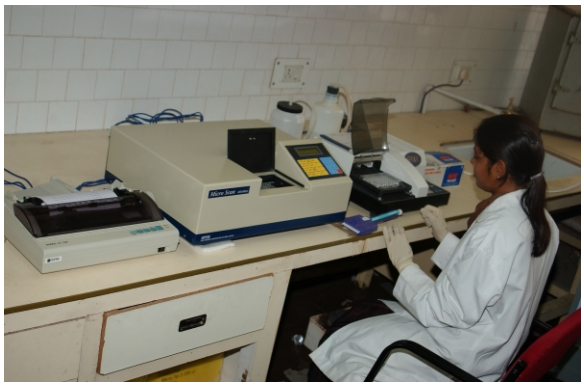
DNA sequencing of *Plasmodium falciparum* gene (MSP-1, MSP-2, MSP-3 and *Pfrct*)



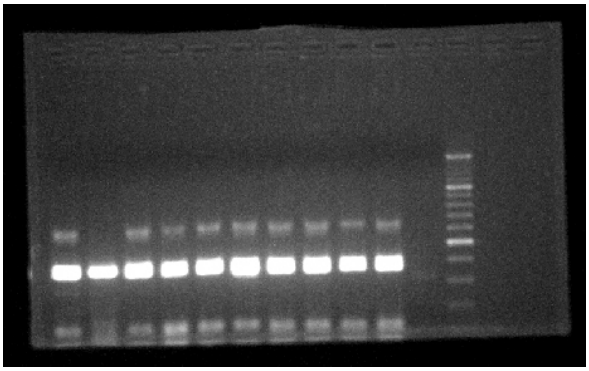
Lymphocyte proliferation assay against different malarial antigen using radioactivity ($_1H^3$)



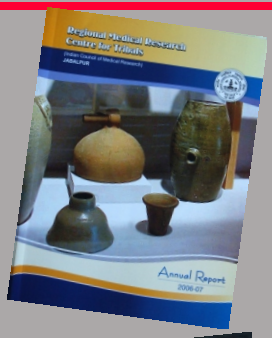
Sporozoite ELISA for determination of sporozoite in *Plasmodium falciparum* & *Plasmodium vivax*



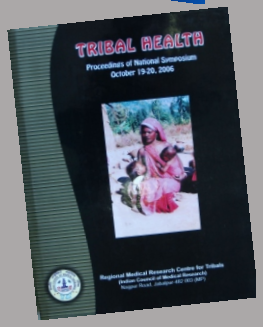
Sibling speciation of *An. fluviatilis* by PCR



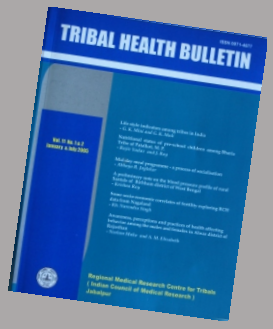
Publication of the Centre



Annual Report of the Centre for the year 2006-07



Proceedings of National Symposium on Tribal Health



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