



Microbiology Newsletter

Sir Ganga Ram Hospital

Volume 15, No. 2

Published December 2009

An Integrated Approach to Rapid Diagnosis of Tuberculosis and HAIN Test for Multidrug Resistance TB at Sir Ganga Ram Hospital

Case Study

A 14 year old male patient (a student from Amritsar) presented with non-healing ulcer on the dorsal aspect of right hand since 3 months. Past history of the patient revealed severe pain and massive swelling on the dorsal aspect of hand extending up to mid forearm following a thorn prick and vigorous massage from a massage center that used some unknown oil. An orthopedic surgeon did incision and drainage 3 months back. Massive amount of necrotic tissue and debris was removed. The patient was treated with multiple course of antibiotics but



Fig. 1

following stitch removal, wound gaped with poor healing for which the patient was referred to the Department of Plastic Surgery. On general physical and systemic examinations no abnormality was detected. An infected raw area was observed on the dorsal aspect of right hand, 8x5 cm size with 3rd and 4th metacarpals exposed. There was marginal oedema and inflammation and loss of extension of right middle and ring fingers (Figure 1).

Initial investigations showed haemoglobin 8.6gm/dl and TLC count 9200/mm³. X-ray right hand showed fracture base of 4th metacarpal and soft tissue swelling on dorsum of hand. Incision biopsy was done and tissue specimen was sent for histopathological examination. No microbiology work-up was done. The patient was discharged on 3rd generation cephalosporin and anti-inflammatory medication. Histopathology showed acute and chronic inflammation. Patient got readmitted after 12 days for excision biopsy of the ulcer and distally based pedicled RAFF (Rectus Abdominus Free Flap) and planned for extensor tendon reconstruction in 2nd stage. A combination antibiotic therapy of Ciprofloxacin, Clindamycin and Netilmycin were started and the biopsy specimen sent for histopathology. No microbiology work-up was done. Histopathology report showed non-specific acute and chronic inflammatory ulcer. When the patient was reviewed further after 10 days, dehiscence of the flap was observed with signs of partial rejection. Tissue samples were sent for various microbiology investigations at this stage. Routine bacterial culture showed heavy growth of *Corynebacterium striatum* which was a bystander. Fungal

smear and culture were negative. Direct fluorescent stain for tuberculosis was negative. Gen Probe test for Tuberculosis (Amplified Mycobacterium Tuberculosis Direct Test, bioMerieux, France) was positive with one sample and negative with another sample and the assays could not be repeated because of insufficient material. However AFB culture grew acid fast bacilli after 35 days of incubation in the Automated BacT/ALERT 3D system which was subsequently identified as *M. tuberculosis* by Accuprobe molecular identification system. On subsequent sensitivity testing the isolate was found to be sensitive to INH, Rifampicin and Ethambutol. Patient was started on first line anti-TB treatment with signs of graft showing satisfactory healing (Figure 2).

Discussion

There are about 1.7 billion tubercle bacilli infected cases world wide, India accounts for nearly 30% of the burden.¹ Multidrug-resistant tuberculosis strains, which are resistant to at least rifampicin and isoniazid, and extensively drug resistant (XDR) TB have emerged worldwide (Table 1). The studies conducted in different parts of the country during 1990s & 2000s show even higher prevalence of MDR tuberculosis. The situation has turned into a pressing demand for rapid diagnosis and drug susceptibility testing in order to develop efficient treatment regimens for individual cases. The technologies available at Sir Ganga Ram hospital range from simple microscopic techniques to rapid automated culture systems to sophisticated molecular based systems. The following are the battery of tests available in the department.

Improved Smear Microscopy

The conventional Zeil-Neelson (ZN) staining had been used most extensively previously. But as an approach to improve the sensitivity, Direct Fluorescence staining (DF) using fluorescent stains Auramine and Rhodamine are used more frequently (recommended by Centers for Disease control and Prevention-CDC) as a superior alternative to ZN stain. In our experience, this technique turned out to be more sensitive especially in extra-pulmonary samples where the bacterial load is low.

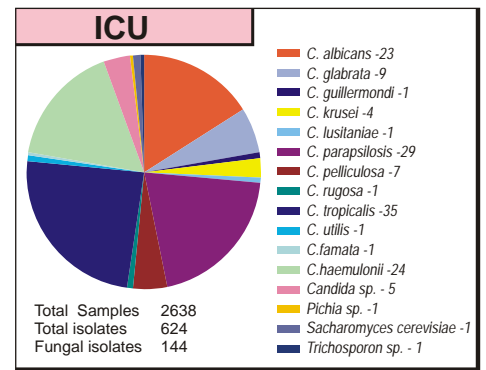
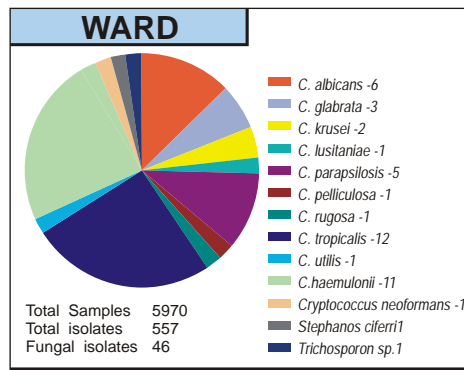
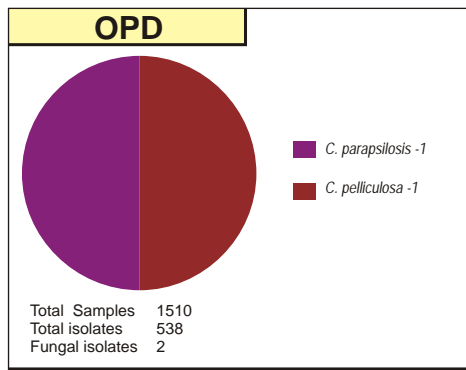
Automated Liquid Culture Drug Susceptibility Testing

Mycobacteria culture on solid media (eg: Lowenstein-Jensen-LJ) is labor intensive and time consuming. Automated liquid cultures are more sensitive for detection of mycobacteria and may increase the yield by 10% over solid media.² The automated liquid culture system (BacT/ALERT-3D) has reduced the average culture detection time to days rather than weeks. The last 3 years data in our hospital shows that the



Fig. 2

contd. on page 7



% Sensitivity in Yeasts Fungi* (Blood Isolates 2008)

| Species (No. of Isolates Tested) | Flucytosine | Amphotericin B** | Fluconazole | Itraconazole | Voriconazole |
|----------------------------------|-------------|------------------|-------------|--------------|--------------|
| <i>C. albicans</i> (27) | 100 | 100 | 100 | 100 | 100 |
| <i>C. tropicalis</i> (46) | 91.3 | 100 | 89.1 | 54.3 | 95.6 |
| <i>C. parapsilosis</i> (33) | 93.9 | 100 | 54.5 | 42.42 | 93.5 |
| <i>C. glabrata</i> (12) | 100 | 100 | 50 | 8.3 | 75 |
| <i>C. haemulonii</i> (31) | - | 3.3 | 0 | - | 77.4 |
| <i>C. neoformans</i> (1) | 100 | 100 | 100 | 100 | 100 |
| <i>C. krusei</i> (6) | 33.3 | 83.3 | - | - | 100 |
| <i>C. pelliculosa</i> (8) | 50 | 100 | 100 | 37.5 | 100 |
| <i>C. utilis</i> (1) | 0 | 100 | 100 | 0 | 100 |
| <i>C. lusitanae</i> (2) | 100 | 100 | 100 | 50 | 100 |
| <i>C. guilliermondi</i> (1) | 100 | 100 | 100 | 100 | 100 |
| <i>C. rugosa</i> (2) | 100 | 100 | 50 | 50 | 100 |
| <i>Candida sp.</i> (5) | 80 | 100 | 40 | 20 | 100 |
| <i>C. famata</i> (1) | 100 | 100 | 100 | 100 | 100 |
| <i>Pichia</i> (1) | 100 | 100 | 100 | 100 | 100 |

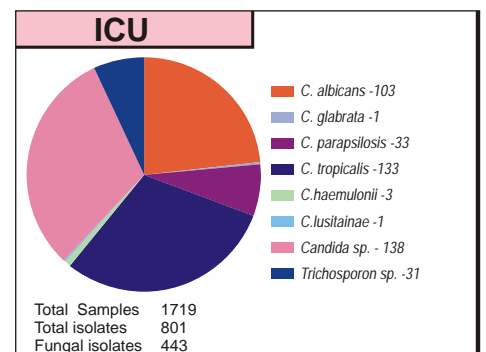
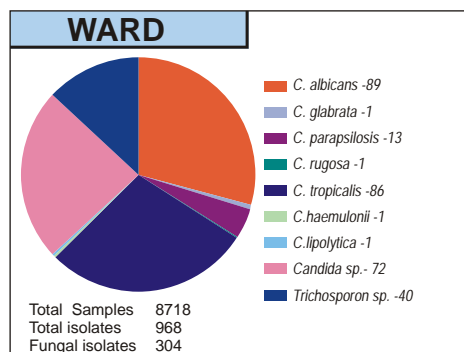
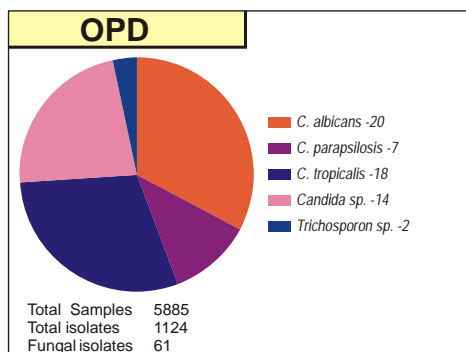
Figures in parenthesis indicate the number of isolates tested. (- = Not done)

Note: 11 Isolates of *C. haemulonii* were tested against Cospofungin and all were sensitive.

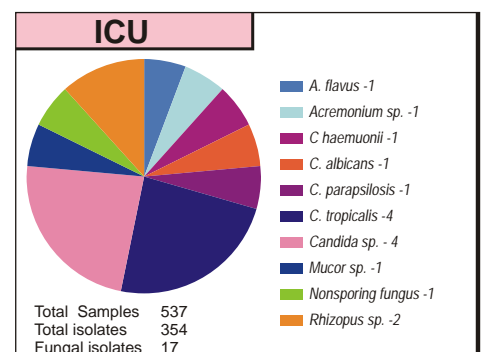
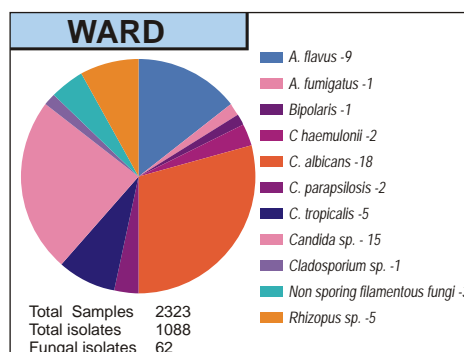
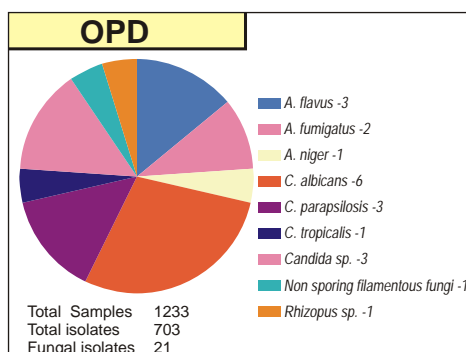
*ATB fungus 3 (bioMerieux, France), E Test (Rpt. isolates excluded), CLSI M-39A Vol. 22, No. 8; 2002 (global consensus guidelines).

**Isolates with MIC of $\leq 1 \mu\text{g/ml}$

URINE - FUNGAL ISOLATES

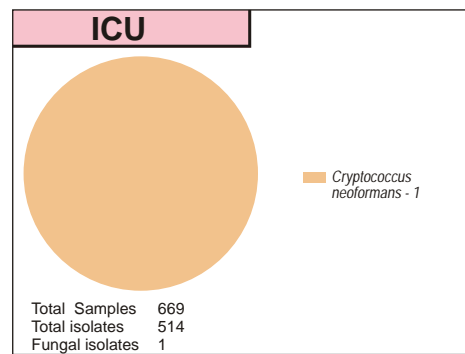
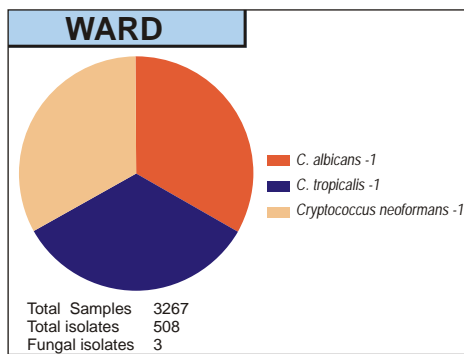
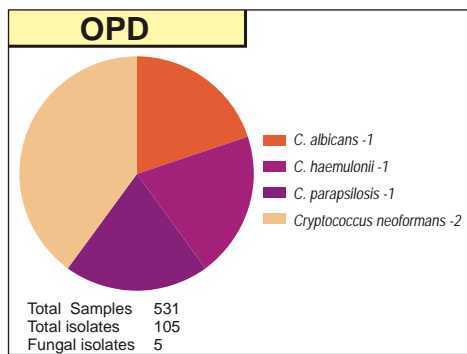


PUS & TISSUE - FUNGAL ISOLATES



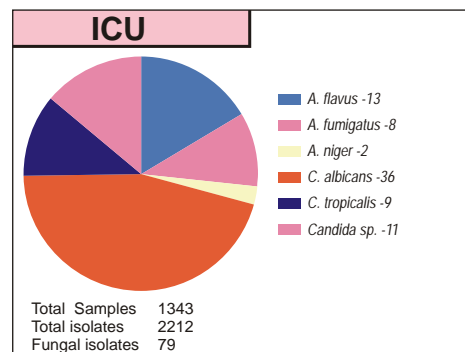
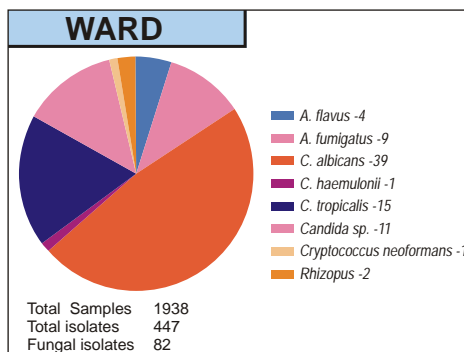
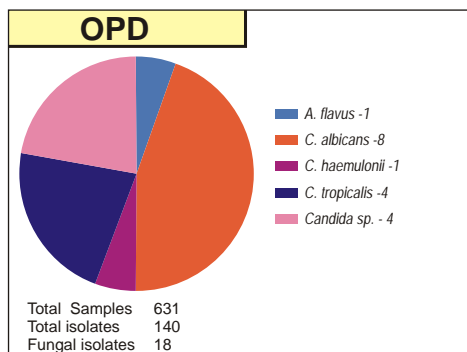
BODY FLUIDS - FUNGAL ISOLATES

(Jan. - Dec. 2008)



RESPIRATORY ISOLATES

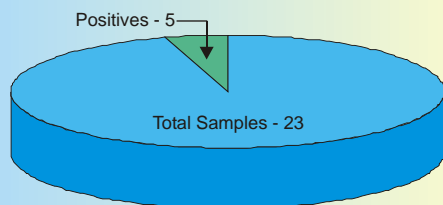
(Jan. - Dec. 2008)



Test for Detecting Cryptococcal Antigen

(Crypto-LA Test, Laboratories Fumouze, France)

(Jan. - Dec. 2008)

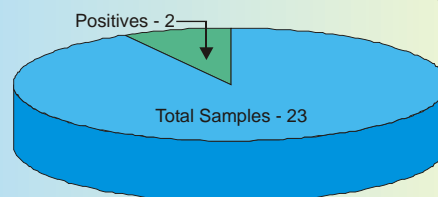


| | Total Samples | Positive Samples | Indeterminate |
|-----|---------------|------------------|---------------|
| CSF | 101 | 5* | 0 |

*4 Samples grew *cryptococcus neoformans*

Immunofluorescence staining for *Pneumocystis jiroveci* (*Pneumocystis carinii*)

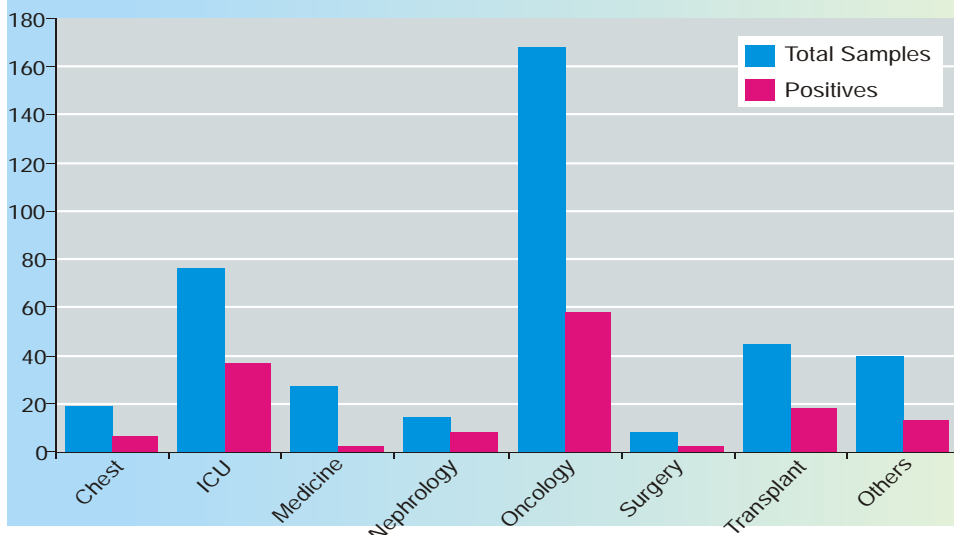
(Monofluo kit, Bio-Rad, France) (Jan. - Dec. 2008)



Pneumocystis jiroveci, previously known as *Pneumocystis carinii*, remains an important cause of pneumonia in immunocompromised patients. The principal laboratory method for the detection of *P. jiroveci*, an organism that cannot be cultivated by standard methods, is the direct visual examination of the clinical specimen after some type of staining method. Traditional cell wall stains such as methenamine silver selectively stain the wall of *Pneumocystis* cysts, while reagents such as Wright-Giemsa stain the nuclei of all developmental stages. Immunofluorescence staining with monoclonal antibodies is more sensitive and specific than histologic staining and hence it is the preferred method for diagnosis in clinical settings.

Galactomannan Antigen Assay

(Jan. - Dec. 2008)

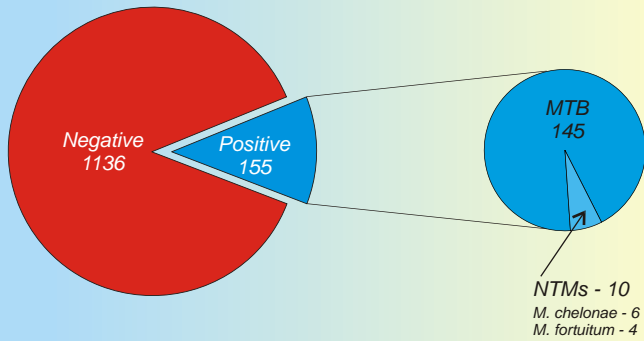


Total Samples Tested - 397
Galactomannan Positives - 144

| Assays | Total Samples | Positives Samples |
|------------|---------------|-------------------|
| Chest | 19 | 6 |
| ICU | 76 | 37 |
| Medicine | 27 | 2 |
| Nephrology | 14 | 8 |
| Oncology | 168 | 58 |
| Surgery | 8 | 2 |
| Transplant | 45 | 18 |
| Others | 40 | 13 |

AFB Culture

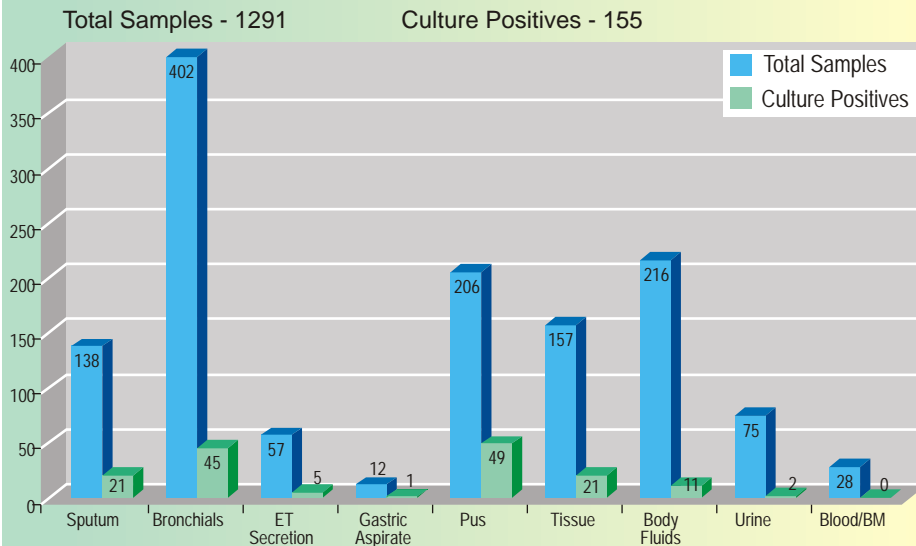
Total Samples Tested: 1291



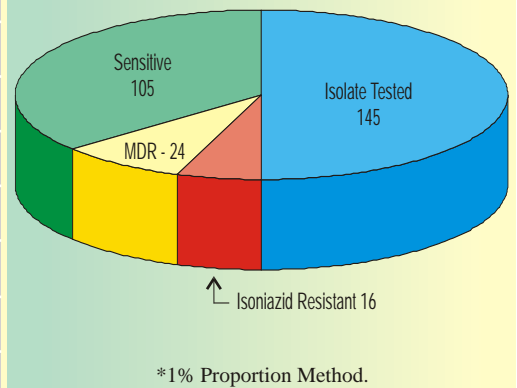
Time to Positivity

| Sample | Smear Status | Mean Time to Positivity (days) | |
|-----------------|--------------|--------------------------------|------|
| | | BacT/ALERT 3D | LJ |
| Pulmonary | Positive | 14.5 | 28.0 |
| | Negative | 21.2 | 33.9 |
| Extra Pulmonary | Positive | 16.0 | 26.9 |
| | Negative | 22.9 | 37.0 |
| All Samples | Positive | 15.2 | 27.9 |
| | Negative | 22.5 | 36.2 |

Culture Positives



Sensitivity of M. tuberculosis*



*1% Proportion Method.

Direct Nucleic Acid Detection for M. tuberculosis

Amplified Mycobacterium Tuberculosis Direct (AMTD) Test
(Gen-Probe Inc., bioMerieux, France)

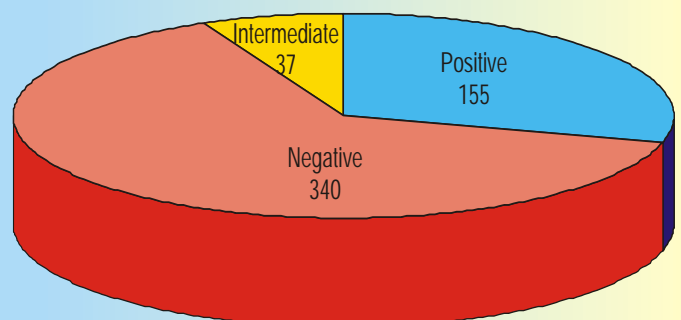
| Sample | Smear Status | No. of Samples | Positives | Indeterminate | Negative |
|-----------------------|--------------|----------------|-----------|---------------|----------|
| Pulmonary (11) | Positive | 5 | 3 | 0 | 2* |
| | Negative | 6 | 1 | 0 | 5 |
| Extra Pulmonary (111) | Positive | 13 | 11 | 0 | 2** |
| | Negative | 98 | 10 | 5 | 83 |

*One sample grew rapid grower and one Nocardia

** One sample grew rapid grower

QuantIFERON TB Gold In - Tube Assay

Total Samples 532



HBV PCR

We are using the platform Real Time COBAS TaqMan 48 Analyzer for the quantitative determination of Hepatitis B viral load. It is an IVD approved assay with a sensitivity of as low as less than 6 IU/ml and as high as 1.1x 10⁸ IU/ml. If no Ct value of HBV is obtained then it is depicted as target not detected making it a more sensitive assay than the available qualitative tests. The detectable linear range is 29 - 1.1x 10⁸ IU/ml. The conversion factor between HBV copies/ml and 1 International Units (IU)/ml is 5.82 copies/ml

| Samples | Nephro | Gastro | Medicine | Paed | Cardio | Uro | Gyn. | Ext. & City |
|--------------------|--------|--------|----------|------|--------|-----|------|-------------|
| Total Sample - 249 | 25 | 150 | 8 | 11 | 4 | 4 | 5 | 42 |
| Positive - 212 | 24 | 123 | 6 | 10 | 3 | 3 | 5 | 38 |

A total of 37 samples had no target detected of which 16.2% (6) were HBsAg positive rest all were HBsAg negative.

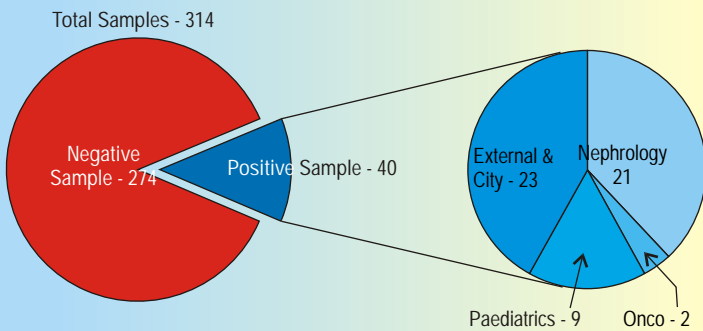
HCV PCR

COBAS TaqMan 48 Analyzer is the Real Time platform used for HCV quantitative assay. It is an IVD approved test. The detection range is as low as 25 RNA IU/ml and a high of 3.9 x 10⁸ IU/ml thus making it more sensitive than the IVD approved HCV Amplicor Qualitative which has a lower detection limit of 50 IU/ml.

| Samples | Nephrology | Gastro | Medicine | Paediatrics | Cardio |
|--------------------|------------|--------|----------|-------------|--------|
| Total Sample - 163 | 34 | 62 | 2 | 27 | 38 |
| Positive - 97 | 31 | 39 | 1 | 9 | 17 |

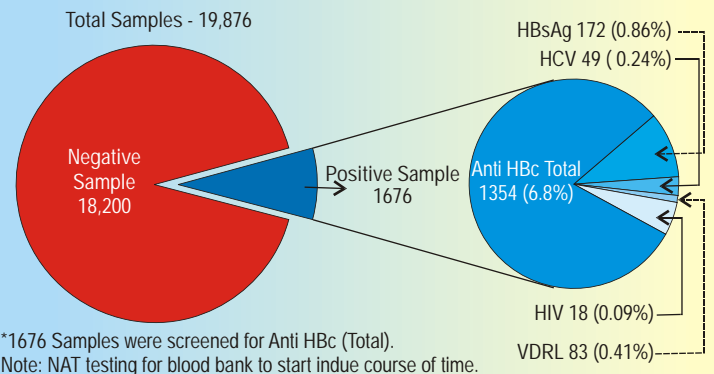
The other Quantitative PCRs started in the year 2009 and data will be reflected in 2010 are EBV, Adenovirus, BK and JC virus Quantitative PCR and HSV and Enterovirus qualitative assay by RealTime NASBA on an EasyQ platform which is also IVD approved.

NASBA CMV



Note: NASBA is being (upgraded) to Real Time NASBA (Nuclisens Easy Q-NASBA) / Quantitative DNA-PCR in due course of time.

Status of Transfusion Transmissible Infections among Blood Donors at SGRH



*1676 Samples were screened for Anti Hbc (Total). Note: NAT testing for blood bank to start in due course of time.

TORCH Serology

| Name of the Test | Total | Obs. & Gyn. | IgG | IgM |
|------------------|-------|-------------|--------------|--------------|
| Toxo | 834 | 391 | 27 (6.91%) | 10 (0.25%) |
| CMV | 2427 | 505 | 254 (50.29%) | 2 (0.39%) |
| Rubella | 1277 | 856 | 443 (51.75%) | 4 (0.46%) |
| Herpes | 1232 | 438 | 91 (20.77%) | 213 (48.63%) |

The TORC assays are done by MINIVIDAS which uses an automated Enzyme linked Immunofluorescent assay. Herpes assay is done by ELISA.

Avidity Test TORCH

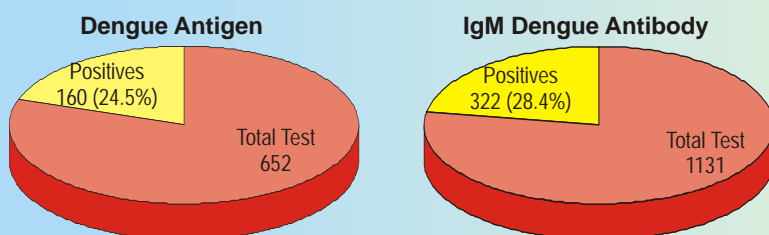
We do avidity for Toxoplasma, Cytomegalovirus and Rubella in our laboratory. CMV and Toxoplasma is done by VIDAS, an automated system which uses the principle of enzyme linked fluorescent assay (ELFA) and Rubella avidity is done by ELISA method. So all the cases of low avidity should be confirmed for fetal infection by prenatal screening of IgM detection in foetal blood by cordocentesis and viral nucleic acid detection in the amniotic fluid or chorionic villi by PCR.

| Name of the Test | Total Samples | High Avidity | Low Avidity | Equivocal |
|------------------|---------------|--------------|-------------|-----------|
| Cytomegalovirus | 33 | 33 | 0 | 0 |
| Toxoplasma | 17* | 12 | 1 | 0 |
| Rubella | 37 | 33 | 2 | 2 |

* 4 Samples of Avidity Testing not done as their IgG titre was negative.

Dengue

Dengue Positivity in the year 2008



Though NS1 antigen and IgM antibodies both develop during the acute phase, but from day1 to day3, NS1 in our hands, was found to be more sensitive.* The use of NS1 detection as a first-line test during the first 4 days of fever could help in earlier diagnosis of dengue fever.

*Dengue NS1 Antigen detection - A useful tool in early diagnosis of dengue virus infection. (Inprint IJMMApril-June 2010)

Tests for Syphilis

(Jan. - Dec. 2008)

1. Rapid Plasma Reagin (RPR) Test
2. Treponema Pallidum Haemagglutination (TPHA)

| Name of the Test | Total Samples Received | Total Samples Positive | Percentage Positivity |
|------------------|------------------------|------------------------|-----------------------|
| RPR | 2761 | 24* | 0.86 |
| TPHA | 33 | 11 | 33.33 |

*Out of these 24, only 13 were tested by TPHA and 11 (84.61%) were found positive and 02 were indeterminate.

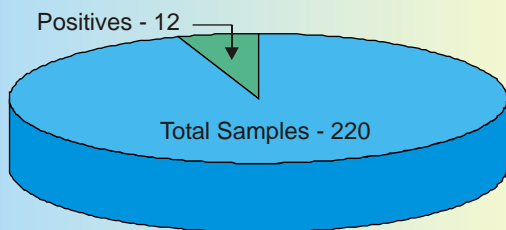
Rapid Test for Enteric Fever Typhidot

Typhidot is a qualitative antibody detection test for the rapid and early diagnosis of typhoid fever (*Salmonella typhi*). The sensitivity of this test is from 84- 93% and specificity is from 77 - 89%. It has a high negative predictive value (96.1%). Presence of IgM antibody alone or both IgM and IgG antibodies indicates acute infection. This assay does not detect *S.paratyphi A* reliably. The final interpretation should be made together with the clinical symptoms. This test was started in Sept. 2008 and by Dec. 2008, 23 samples were tested for typhidot IgM and 12 samples were tested for typhidot IgG.

| Test - Typhidot | Total Samples Tested | Total Positive | Total Negative |
|-----------------|----------------------|----------------|----------------|
| IgM | 23 | 08 | 15 |
| IgG | 12 | 01 | 11 |

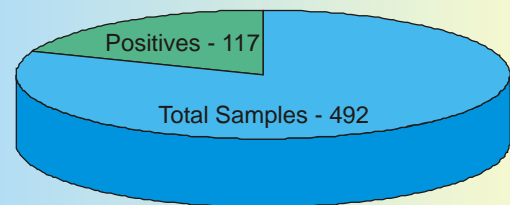
Test for Leptospira Antibodies

Leptocheck Rapid test for IgM antibodies to Leptospira



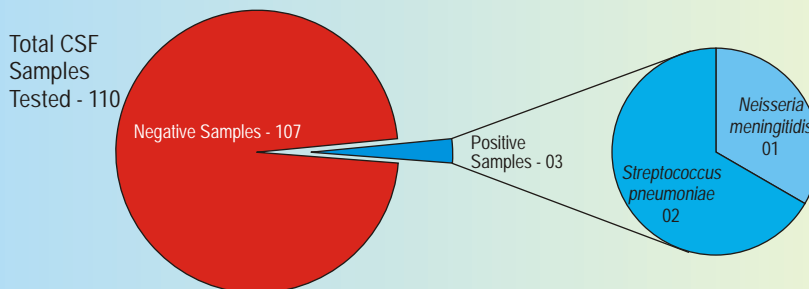
| Total Samples Tested | Total Samples Positives | Percentage Positivity |
|----------------------|-------------------------|-----------------------|
| 220 | 12 | 5.45% |

Test for Group A - Streptococcus Anti-Streptolysin O (ASO) (Test by Nephelometry)**



| Total Samples Tested | Total Samples Positives | Percentage Positivity |
|----------------------|-------------------------|-----------------------|
| 492 | 117 | 23.78% |

Test for Detecting Bacterial Antigen in C.S.F.



| Total CSF Samples Tested | Total Positives | Neisseria meningitidis | Streptococcus pneumoniae |
|--------------------------|-----------------|------------------------|--------------------------|
| 110 | 03 | 01 | 02 |

IMMUNOLOGY

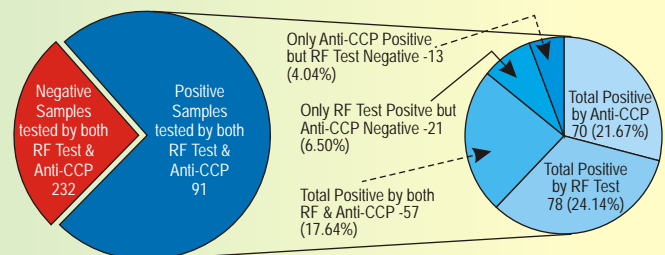
(Jan. - Dec. 2008)

DIAGNOSIS OF RHEUMATOID ARTHRITIS

1. Rheumatoid Factor (RF) Test by Nephelometry
2. Anti-CCP ELISA Test

| Name of the Test | Sample Tested | Positive Sample | Percentage Positivity |
|--|---------------|-----------------|-----------------------|
| Rheumatoid factor (RF) Latex Agglutination | 1711 | 236 | 13.79 |
| Anti-CCP ELISA | 667 | 130 | 26.20 |

Comparison of Anti-CCP ELISA Test with RF Factor Test
Total No. of Samples tested by both RF Test and Anti-CCP - 323



Detection of C3 and C4 Levels in Blood by Nephelometry. Detection of C3 and C4 levels is very helpful in the diagnosis and management of various diseases like Systemic Lupus Erythematosus, Glomerulonephritis, Gram-negative septicemia, Factor I deficiency, acute phase reactions, chronic inflammation, connective tissue disorders, Rheumatoid Arthritis etc.

| NAME OF THE TEST | TOTAL SAMPLES | NORMAL LEVELS | RAISED LEVELS | REDUCED LEVELS | NORMAL VALUES (MG/L)* |
|------------------|---------------|---------------|---------------|----------------|-------------------------------------|
| C3 | 758 | 298 | 256 | 204 | Male: 970-1576 Female: 1032-1495 |
| C4 | 475 | 265 | 128 | 82 | Male: 162- 445 Female: 167- 385 |

*Source Product Insert of The Binding Site.

PARASITOLOGY AT SGRH

Following tests are available in our department.

1. Microscopical Tests:

- i) Direct stool microscopy for parasite ova/cyst.
- ii) Formal Ether Concentration Method for Parasites.
- iii) Kinyoun's staining for *Cryptosporidium*/Microspora/ Isospora sps. etc.

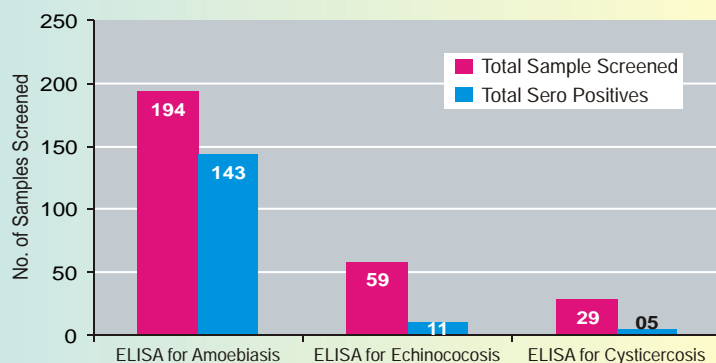
- iv) Direct smear from Liver abscess aspiration for seeing amebic trophozoites.
 - v) Direct smear from Hydatid fluid/Sputum for seeing hooklets and scolices.
2. Serological Tests: Quantitative Antibody (IgG) detection assay for Amebiasis, Echinococcosis and Cysticercosis by ELISA. These are all qualitative assays only.

Stool Microscopy Findings:

| Total Sample Screened | Type of Ova / Cyst / Larvae found (%) | | | | | | | Samples screened by Kinyoun's for <i>Cryptosporidium</i> Oocysts | |
|-----------------------|---------------------------------------|------------------------------|-------------------------|-------------------|-----------------------------|----------------------------------|-----------------|--|------------------------|
| | <i>Giardia</i> | <i>Entamoeba histolytica</i> | <i>Hymenolepis nana</i> | <i>Taenia Sps</i> | <i>Ascaris lumbricoides</i> | <i>Strongyloides stercoralis</i> | Total Positives | Total Samples | Total Positive Samples |
| 2003 | 59 | 18 | 04 | 02 | 04 | 02 | 89 (4.44%) | 152 | 79 (49.68%) |

Parasitic Serology

| Name of Test | Total Sample Screened | Total Sero Positives | Percentage Sero-Positivity |
|--------------------------|-----------------------|----------------------|----------------------------|
| ELISA for Amoebiasis | 194 | 143 | 73.71% |
| ELISA for Echinococcosis | 59 | 11 | 18.64% |
| ELISA for Cysticercosis | 29 | 05 | 17.24% |

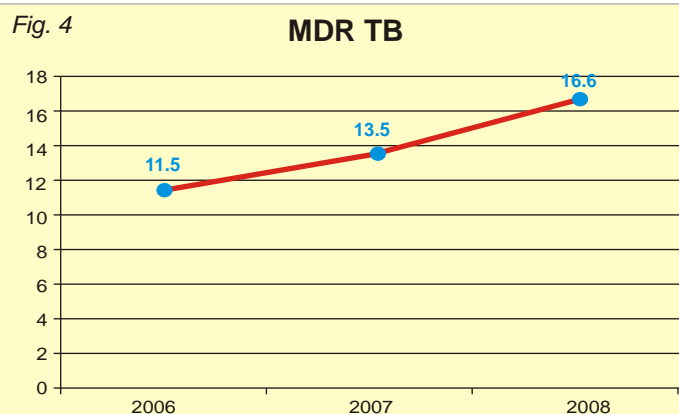
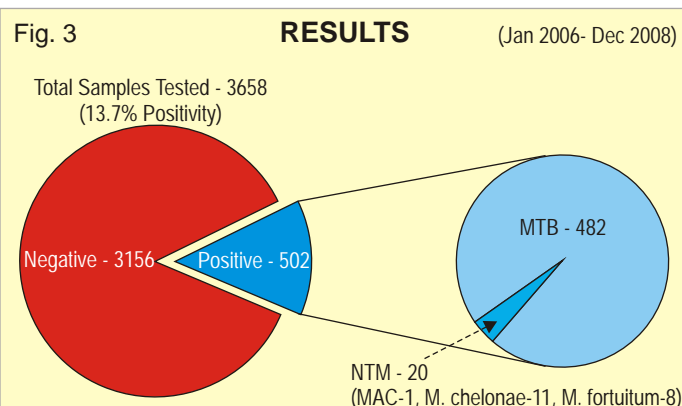


An Integrated Approach to Rapid

(contd. from page 1)

average culture detection time in case of smear positive samples are reduced from 27.9 days in LJ media to 15.2 days in BacT/ALERT-3D. In case of smear negative samples it is 22.5 days in BacT/ALERT and 36.2 days in LJ media. Rapid identification of the positive culture isolates are done by the Accuprobe identification system which is a nucleic acid hybridization test detected by chemiluminescence. It includes tests for the identification of MTB complex, *M. avium complex*, *M. avium*, *M. intracellulare*, *M. kansasii* and *M. goodii*. The time required for the test is 2 hours in contrast to the conventional biochemical tests requiring 3 to 6 weeks or even longer and also the test is highly specific. Our last 3 years data (Jan 2006 - Dec 2008) on rapid TB culture and identification is given in Figure 3.

For drug susceptibility testing also, the delay may be reduced to as little as 10 days in automated liquid cultures compared to 28-42 days in solid media. We do the first line sensitivity testing for 4 drugs (INH, Rifampicin, Ethambutol and Streptomycin). An alarming increase in MDR tuberculosis from 11.5% in 2006 to 16.6% in 2008 was observed in our hospital (Figure 4). The second line sensitivity panel of 6 drugs (Amikacin, Ofloxacin, Kanamycin, Capreomycin, D-cycloserine and PAS) was started from Jan 2009 and we have isolated one XDR tuberculosis case till now.



Quantiferon-TB Gold In-Tube Assay (Interferon-gamma Release Assay)

T cell based interferon-gamma release assays (IGRAs) are in vitro blood tests that are based on interferon-gamma release after stimulation by TB specific antigens (ESAT-6 and CFP-10). IGRAs have high specificity and are unaffected by prior BCG vaccination or sensitization to non-tuberculous mycobacteria.⁴ The sensitivity of IGRAs in active TB is 75% to 90%. These are useful tests for the detection of latent TB infection, however, they cannot distinguish between latent and active TB. In cases where microbiological diagnosis is often hard to establish, IGRAs may offer supporting evidence to help establish a diagnosis of active TB.

Nucleic Acid Amplification Tests

TMA (Transcription-mediated amplification) based Amplified Mycobacterium Tuberculosis Direct Test (AMTDT)-Gen-Probe Inc., bioMerieux, France), which is an FDA approved assay, for direct detection of *M. tuberculosis* in both smear positive and smear negative pulmonary samples is presently being done in our laboratory. The test qualitatively detects *M. tuberculosis complex* rRNA. Compared to culture, the sensitivity of the test ranged from 65 to 97% in different studies, whereas the specificity was very high. In our experience the sensitivity was as high as 93.4% for pulmonary samples and 82.9% for extra-pulmonary samples.

contd. on page 8

An Integrated Approach to Rapid

(contd. from page 8)

GenoType MTBDRplus (Hain Lifescience, Nehren, Germany)

Recently, a combined multiplex polymerase chain reaction (PCR) and DNA strip hybridization assay, the GenoType MTBDRplus has been developed by Hain Lifescience, Nehren, Germany. The technique combines multiplex PCR followed by hybridization to specific membrane-bound probes for the identification of either wild-type or specific mutations. The kit detects mutations in the genes conferring resistance to RIF (*rpoB*), high-level INH (*katG*) and low level INH (*inhA*) resistance in addition to the detection of the presence of *M. tuberculosis* in smear positive pulmonary samples. The MDR status of the strain may be provided to the clinician within 24 hours after receipt of the sample. A recent laboratory evaluation study from South Africa estimated the accuracy of the GenoType MTBDRplus assay performed directly on AFB smear positive sputum specimens. Compared with conventional drug susceptibility testing, the sensitivity, specificity, positive, and negative predictive values were 98.9%, 99.4%, 97.9% and 99.7% for detection of rifampicin resistance; 94.2%, 99.7%, 99.1% and 97.9% for detection of isoniazid resistance; and 98.8%, 100%, 100% and 99.7% for detection of multidrug resistance compared with conventional results.⁵ The assay is presently being standardized in our laboratory.

GenoType Mycobacteria Direct (GTMD)

This is a novel commercial assay from Hain Lifescience, Nehren, Germany based on the nucleic acid sequence-based amplification (NASBA) and DNA strip techniques, allowing the 23S rRNA amplification based detection of *M. tuberculosis* complex, *M. avium*, *M. intracellulare*, *M. kansasii* and *M. malmoense* directly from decontaminated clinical specimens. It is important to differentiate quickly between *M. tuberculosis* complex and NTM, as this enables earlier decisions on optimum drug therapy and appropriate infection control measures. The test is validated for pulmonary as well as extra-pulmonary, smear positive and negative specimens. Sensitivity, specificity, positive predictive and negative predictive values for GTMD are 92, 100, 100 and 77% respectively.⁶ We will be shortly introducing this assay in our laboratory.

Table 1 Prevalence of MDR Tuberculosis

| Global: (1999 - 2002) | India: (1990s and 2000s) |
|--|-------------------------------------|
| New Cases: 1.1% (0 - 14.2%) | New cases: 0.5 - 7.2% |
| Previously Treated Cases: 7% (0-58.3%) | Previously treated cases: 11.8-100% |

References

1. World Health Organization. WHO report on the tuberculosis epidemic. WHO/TB/97.223. Geneva: WHO;1997.
2. Cruciani M, Scarparo C, Malena M, Bosco O, Serpelloni G and Mengoli C. Meta-analysis of BACTEC MGIT 960 and BACTEC 460 TB with or without solid media for detection mycobacteria. J Clin Microbiol. 2004;42:2321-2325.
3. Steingart KR, Henry M, Laal S et al. Commercial serological antibody detection tests for the diagnosis of pulmonary tuberculosis: a systematic review. PLoS Med 2007;4:e202.
4. Pai M, Zwerling A, Menzies D. Systematic review: T-cell assays for the diagnosis of latent tuberculosis infection-an update. Ann Intern Med 2008;149:177-184.
5. Barnard M, Albert H, Coetzee G, O'Brien R, Bosman ME. Rapid molecular screening for MDR TB in a high volume public health laboratory in South Africa. Am J Respir Crit Care Med 2008;177:787-792.
6. Luna FFA, Ruiz P, Gutierrez J and Casal M. Evaluation of the GenoType mycobacteria Direct Assay for detection of Mycobacterium tuberculosis complex and four atypical mycobacterial species in clinical samples. J Clin Microbiol. 2006;44:3025-3027.

Publications for the Year 2009

1. C Wattal, R Raveendran, A Kotwani, A Sharma, SK Bhandari, TL Sorensen and K Holloway. Establishing a new methodology for monitoring of antimicrobial resistance and use in the community in a resource poor setting. Journal of Applied Therapeutic research, 2009;7(2): 37-45
2. C. Wattal, A. Sharma, R.Raveendran, SK Bhandari, S. Khanna. Community-Based Surveillance of Antimicrobial Use and Resistance in Resource Constrained Settings. Report on five pilot projects, World Health Organization. 2009; WHO/EMP/MAR/2009.2

Abstracts

1. Oberoi JK, Sanghamitra D, Goel N, Raveendran R, Prasad KJ, Wattal C. Epidemiology of candida bloodstream infections in a tertiary care institute in india between 1999 and 2008. "XXXIII National Conference of Indian Association of Medical Microbiologists (IAMM)" at Mysore on 7th November 2009
2. Raveendran Reena, Oberoi JK, Wattal C, Goel N, Sanghamitra D, Prasad KJ. Multiple drug resistance in pulmonary and extra pulmonary tuberculosis in a tertiary care hospital, New Delhi. XXXIII National Conference of Indian Association of Medical Microbiologists (IAMM)" at Mysore on 7th November 2009
3. Shilpi Khanna, JK Oberoi, S Datta, AS Soin, S Aggarwal, C Wattal. Use of galactomannan antigen assay for diagnosis of invasive aspergillosis in high risk patients. Annual conference of Delhi Chapter meet of Indian Association of Medical Microbiologists on 28th March 2009.

Reflections

Thanks for sending your newsletter. As usual you and your team are doing very efficient work. Please keep on sending me also the hard copy of your newsletter. I like to feel the results in my hands.

Dr. Ramzan Rangoonwalla,
I.D Consultant, Frankfurt, Germany

Thanks you for the wonderful publications that you have sent by mail. I really admire your dedication and meticulousness. I wish more of us can emulate you.

Brig. (Mrs.) Ketoki Kapila, Brig Med (Medical Branch)
HQ M&G Area, Colaba, Mumbai

Thanks Dr. Wattal the article on antibiotic resistance was interesting.

Dr. Rajni Gaind, Senior Microbiologist
VMCM & Associated Safdarjung Hospital, New Delhi

Thank you for these impressive publications. Congratulations.

Dr. Yehuda Carmeli, Head Epid & Preventive Med.,
Tel-Aviv Medical Centre, (Israel)

Congratulation ! Excellent work.

Dr. Arunaloke Chakrabarti, Professor,
Deptt. of Medical Microbiology, P.G.I., Chandigarh

DEPARTMENT OF CLINICAL MICROBIOLOGY

Faculty

Dr C. Wattal
MD
Sr. Consultant & Chairman

Dr J.K. Oberoi
MD
Jr. Consultant

Dr Neeraj Goel
MD
Jr. Consultant

Dr K.J. Prasad
Ph.D
Sr. Research Officer

Dr S. Datta
MD
Jr. Consultant

Dr R. Raveendran
MD
Jr. Consultant

DNB Student
Dr Shuaib Ahmed Mir