

B. Research Projects

Please indicate PG dissertations done in your department. Describe **briefly** in **lay** language the importance of each of the research project in no more than 5 lines.

PG Thesis

1. Dr.Anila A Mathews (2008)

Characterization of Staphylococci and Evaluation of Methods for Detection of Methicillin Resistant *Staphylococcus aureus* (MRSA)

Staphylococcus aureus is commonly isolated from pus (from purulent lesions) in both hospitalized and outpatients. About 40% of these have developed resistance to Methicillin group of drugs (MRSA), which were the most popular antibiotics (cloxacillin) used for these infections. The cefoxitin disc diffusion for detection of MRSA was found to be as good as the molecular method and it was better than the then used oxacillin disc diffusion method

2. Dr.Priya S (2010)

Molecular Detection of Rifampicin Resistance in *M.tuberculosis*

Tuberculosis is one of the most important infectious diseases prevalent in our country. Antituberculous drugs should be given for longer period. Incidence of Multi drug resistance is increasing in many parts of the country. It is important to test whether the *Mycobacterium tuberculosis*, the bacteria which causes tuberculosis is sensitive or not to the drugs which the patient is taking. We have performed antibiotic sensitivity test for Isoniazid, and Rifampicin in 70 bacterial isolates obtained from patients. Multidrug resistance was observed in 8.6 % of bacteria. Further characterization of Rifampicin resistant bacteria was done by polymerase chain reaction (PCR), which is a molecular diagnostic tool. DNA sequencing of these 5 isolates led us to find a novel mutation, not reported earlier.

3. Dr.Sowmya N (2011)

Isolation, identification and invitro antifungal susceptibility of Dermatophytes”

Ring worm infection is one of the common fungal infections of skin. It is caused by various fungi named as dermatophytes. Three hundred patients were studied for the aetiology of this fungal infection. *Trichophyton mentagrophytes* accounted for majority of infections, followed by *Trichophyton rubrum*. We isolated rare fungi like *Trichophyton megenii*, *Trichophyton kanei* and *Trichophyton ferrugineum*. Antifungal susceptibility of all the dermatophytes were studied by broth microdilution method, first time in South India. No antifungal resistance was observed in all these fungi.

4. Dr.Jacynth Angel (2012)

Comparative evaluation of Enzyme linked immunosorbent assay (ELISA)and indirect immunofluorescence (IFA)for detection of antinuclear antibodies in autoimmune diseases”

Antinuclear antibodies are diagnostic for connective tissue diseases like Systemic lupus erythematosus SLE, scleroderma etc. ELISA is the commonly done test for its detection, but we found out in this study that the false positive rate of this test is very high and therefore, IFA is a better test for routine diagnosis although the infrastructure required is costlier and special technical expertise is required.

5. Dr.Sangeetha N (2012)

“Role of molecular methods in the diagnosis of dengue”

In this part of the country using Dengue IgG and IGM, out of 1,727 patients studied, 41% were found to be positive. Among these cases 29.6% were found to be primary dengue and 70.4% secondary dengue infections. We studied the utility of dengue antigen and molecular diagnostic test, polymerase chain reaction (PCR) for diagnosis and typing .Antigen was positive in 50% of dengue cases. PCR was found to be useful only in patients with less than 6 days fever. Type2 Dengue virus was found to be prevalent in Coimbatore.

ICMR 2009

1. Dr.Marina Thomas

“Incidence of fungal colonization among patients admitted in critical care units of PSG Hospitals”

Extensive use of broad spectrum antibiotics along with other risk factors can promote fungal colonization especially in patients admitted to critical care areas. In this two month study we found that 12% of all ICU patients were colonized with *Candida* species which is much lower than in other studies (65%).

2. Dr.J.Jayalakshmi

“A study of antibiotics prescribing patterns and sensitivity patterns of common micro organisms in the intensive care units of teaching hospitals”

Usage of antibiotics is the highest in the ICUs and resistance to these antibiotics is an important problem influencing patient outcome. This study for 2 months period showed the total antibiotic consumption, the most commonly prescribed drug and the organisms that were found to be resistant to commonly used antibiotics.

3. Dr.M.Dheepa

“Correlation between biofilm production and multiple drug resistance in clinical isolates of *Acinetobacter baumannii*”

Multidrug-resistant *Acinetobacter baumannii* has been reported worldwide and is recognized as one of the most difficult healthcare-associated infections to control and to treat. We chose to investigate biofilm formation by clinical isolates of *A. baumannii* and multiple drug resistance among them and tried to correlate them in order to understand how this pathogen persists in the hospital environment and causes outbreaks. Our investigations showed a simultaneous emergence of resistance to many antimicrobial agents available and represent a severe threat in the treatment of hospitalized patients. This study demonstrates a high propensity among the clinical isolates of *A. baumannii* to form biofilm and a significant association of biofilm with multiple drug resistance.

4. Dr.Anila A Mathews

“Clinical utility of Typhidot in the diagnosis of Typhoid fever”

Typhoid Fever is a severe systemic infection caused by *Salmonella typhi*. It is endemic in many developing countries, particularly in South East Asia, the Indian sub-continent, South and Central America and Africa. Conventional method of diagnosis: include Blood culture and Widal test. In this study we used Typhidot and compared it with the conventional methods and found that it can be used in places where blood culture is not available and affordable and the turnaround time of the test is also just 2 hours.

5. Mr.A.C.Baskaran

“Screening of patients for MRSA and ESBLs producers during admission in ICU”

Increasing incidence of Hospital acquired infection is major burden for patient and physician. Particularly when the patient is infected with MRSA and ESBL. The source of infection may be Exogenous (or) Endogenous. Screening of patients for endogenous colonization of MRSA and ESBL may help, to know the incidence of colonization, risk for further development of infection to patient. Screening also helps to Isolate the patient in the ICU and to take necessary steps to control the spread of infection to others in ICU.

ICMR -2010

1. Dr.B.Appalaraju

“Asymptomatic bacteriuria in Type -II diabetic women”

Asymptomatic bacteriuria is an important precursor of Urinary tract infections (UTI).The later in turn lead to a variety of complications, most of which affect renal function. One hundred patients with Type II Diabetes were included in the study. In this study 9% of diabetic women were found to be having asymptomatic bacteriuria. *Escherichia coli* was the most common bacteria causing this infection. The complications can be prevented by early detection and treatment

2. Dr.Marina Thomas

Comparison of resistance pattern in commonly occurring bacteria to Ciprofloxacin among infections in ICU and out patients.

Ciprofloxacin is a very commonly used antibiotic for infections. In this study we found that the concentration of Ciprofloxacin needed to inhibit bacteria was higher in the bacteria that were isolated from Intensive care patients as compared with that in outpatients. This could be due to the fact that Ciprofloxacin is used more extensively in ICU patients. It is known that resistance is higher in those antibiotics which are extensively used than in those that are sparingly used

3. Dr.J.Jayalakshmi

“To evaluate the usefulness of a novel bilayered medium for a rapid and better isolation of Mycobacterium tuberculosis from clinical specimens”

Tuberculosis still represents a major public health problem, especially in resource poor countries and there is a need for an inexpensive, rapid method for an early diagnosis of *M tuberculosis* to initiate treatment. A novel bilayered medium was found to be a simple and cost effective alternative for culture and sensitivity of *M tuberculosis*.

ICMR - 2011

1. Dr.Marina Thomas

Analysis of Weil Felix test as compared to Gold Standard Elisa test for the diagnosis of Scrub typhus in PSG hospitals

Scrub typhus is transmitted by larvae of an insect called 'mites' and the patient has fever and rashes during the illness. Weil felix test is a century old test routinely done for its diagnosis. In this study we found that this test can still be done routinely, provided two tests are done to demonstrate a rise in antibody titer. However, ELISA test is a more specific test and therefore has more diagnostic value.

2. Dr.S.Parvathi

“Comparative evaluation of gram stain and Acridine orange stain from automated blood cultures”

This study was done to evaluate the efficacy of the rapid Acridine orange stain over Grams stain from blood cultures in cases of bacteremia. The study revealed that the Acridine orange stain is more sensitive than Grams stain and could be used for rapid screening of Bacteremias.

3. Dr.J.Jayalakshmi

“Evaluation of leukocyte esterase dipstick test for the detection of spontaneous bacterial peritonitis”

Spontaneous bacterial peritonitis (SBP) is a serious and potentially life-threatening complication that can occur in cirrhotic patients with ascites. Timely diagnosis and prompt antibiotic treatment is required for the survival of SBP patients. A Leukocyte esterase (LE) Dipstick for early and rapid diagnosis was evaluated. The Sensitivity and Specificity of the LE test was found to be 85.71% and 100% respectively.

4. Dr.Anila A Mathews

“Impact of blood cultures drawn by phlebotomy on contamination rates and health care cost in ICU ward of a tertiary care hospital”

Blood culture is the most important microbiological test in the diagnosis of serious infection especially for detecting bacteraemia in patients and venepuncture is the most routinely performed invasive technique to obtain blood for blood culture tests. Like any other test, however, false-positive blood culture results can limit the utility of this important tool. The study was done in two phases. The results of the two phases of study (one before the intervention and one after the intervention) were compared. Though it was a pilot study of just 2 months, involving mainly the ICU, there was a significant fall in contamination rates from 12.6% to 5.3% and subsequent decrease in health care costs during the second phase.

5. Mr.A.C.Baskaran

“Invitro activity of extended spectrum beta lactamase antibodies against extended spectrum Beta lactamase producers”

Members of the family *Enterobacteriaceae* commonly express plasmid encoded extended spectrum beta lactamases which confer resistance to penicillin, cephalosporins and cephamycins and they are also prone to developed resistance to various drugs . The treatment choice is limited for these beta lactam producers. Beta lactam inhibitors such as (Clavulanic acid and sulbactam) are also not effective in inhibiting ESBLs. Aim of this study is to raise the antibody against ESBL enzyme and to find out whether these antibodies can neutralize the enzyme.

ICMR – 2012

1. Dr.Marina Thomas

“Role of biofilm in the pathogenesis of urinary infection in catheterized patient”

When a patient is put on a urinary catheter for long periods of time, bacteria from the perineum may migrate along the catheters and form biofilms and cause urinary infections. This study analyses how many of the urinary isolates from catheterised patients are biofilm producers and how it correlates with pyuria, treatment regimen and resolution of Urinary tract infections

2. Dr.S.Parvathi

“Comparative evaluation of MODS assay and MGIT for detection of MDR Mycobacterium tuberculosis”

This assay is a simple, cost effective method for screening of multidrug resistance in *M.tuberculosis*. Liquid broth is used with incorporation of bacterial suspension and drugs Isoniazid and Rifampicin and if cording is observed under the inverted microscope it is taken as resistant. It could be used in settings where other methods of detection using MGIT are not available.

3. Dr.J.Jayalakshmi

“Screening for intestinal colonization of Carbapenem resistant enterobacteriaceae among hospitalized patients”

Carbapenems are often the last active antibiotics for serious infections caused by multidrug resistant enterobacteriaceae. However, during the past decade Carbapenem resistance in Enterobacteriaceae (CRE) has emerged, and infections with CRE or carbapenemase producing enterobacteriaceae have been increasingly reported. CRE infections lead to high morbidity and mortality because of limited treatment options. Gastrointestinal carriage may serve as a reservoir for CRE and cross-transmission in healthcare settings has potentially devastating consequences for global public health. Therefore, active surveillance among high risk patients has been deemed important for controlling this infection.

4. Dr.M.Dheepa

“Comparison of plasmid profile and multi drug resistant in ESBL producing Escherichia coli from a tertiary care hospital in south India”

It has been known for some time that plasmids are important in the spread of antibiotic resistance. There is a strong correlation between the number of plasmids present and resistance to various drugs. *Escherichia coli* is an important opportunistic pathogen that has shown an increasing antimicrobial resistance to most antibiotics. The present study is undertaken to determine the prevalence of ESBL producing *Escherichia coli* and to correlate the number of plasmids and multidrug resistance in the same organism.

5. Dr.Anila A Mathews

“Prevalence of catheter associated urinary tract infection in a tertiary care facility”

Catheter-associated (CA) bacteriuria is the most common health care-associated infection worldwide and is a result of the widespread use of urinary catheterization, much of which is inappropriate, in hospitals and long term care facilities. Considerable personnel time and other costs are expended by health care institutions to reduce the rate of CA infections, especially those that occur in patients with symptoms or signs referable to the urinary tract. This study will analyze the prevalence of catheter associated urinary tract infection in our hospital, the most common organisms isolated and their sensitivity patterns.

6. Mr.A.C.Baskaran

“Invitro activity of Metallo beta lactamase antibodies against Metallo beta lactamase Producers”

Gram Negative Bacilli are frequently isolated from various clinical specimens. They acquire various drug resistance mechanisms including Beta lactamases, efflux pumps, and alter membrane permeability. Carbapenems are often used as last line against multi drug resistant bacteria. These carbapenams are also inhibited by Zinc based enzyme metallo beta lactamases. Aim of this study is to raise the antibody against enzyme metallo beta lactamases and to find out whether these antibodies can neutralize the enzyme.

MSc Projects:

2009:

1. Dr.B.Appalaraju

“Isolation of Uropathogens by Chromogenic Media & detection of virulence factors of *Escherichia coli*”

Laboratory diagnosis of urinary tract infections by conventional culture techniques and biochemical tests is time consuming and labour intensive. Chromogenic media like Chromocult UTI agar are used recently to culture and identify bacteria from urine samples avoiding biochemical tests. We found that 98% of urinary bacteria could be correctly identified by using this new media which can reduce the Turn Around Time.

2. Dr.Marina Thomas :

i) **“Characterization of *Candida* species and effect of inoculum size on detection of *Candida* growth by the BacT Alert 9240 automated blood culture system and Biphasic fungal media”** Bactec automated system detects *Candida* growth earlier than

by the biphasic media. Small inoculum sizes take a longer time to grow (48hrs) as compared to large inoculum size (10hrs). Among the common species of medically important *Candida*, *C.glabrata* takes longer time to grow in both Bactec and biphasic fungal media. When the inoculum size is higher, such as 100 CFU/ml, there is no difference in the time to detection among various species.

- ii) **“Detection of Herpes Simplex virus from clinical samples by polymerase chain reaction”** Out of the 35 consecutive samples received from patients suspected to have Herpes, 13 (37%) were positive for HSV. Among the 13 positive, 4 (30.76%) were positive for HSV 1 alone, 5(38.56%) were positive for HSV 2 alone, 4(30.76%) were positive for both HSV 1 and HSV 2(coinfected). PCR can diagnose HSV in cases which are not classical in its clinical picture.

3. Dr.S.Parvathi

“Evaluation of Four screening methods for the detection of significant bacteriuria”

Presumptive diagnosis of urinary tract infections are done by simple tests. This study was done using nitrite test, grams stain, pyuria and screening agar. Screening agar and pyuria were found to be more sensitive compared to other methods and correlated well with culture.

4. Dr.J.Jayalakshmi

- i. **“Detection of carbapenem resistant enterobacteriaceae in clinical isolates at tertiary care hospital.”**

Carbapenem Resistant *Enterobacteriaceae* (CRE) poses significant treatment challenges and have been associated with increased mortality, length of stay and cost. It is therefore important to identify them earlier and to implement infection control measures to prevent their spread in the Hospital an incidence of 1.1% (6) carbapenemase producing enterobacteriaceae was found by Modified Hodge test MHT in a 3 months study.

- ii. **“Detection of AmpC Beta lactamase production in clinical isolates of *Escherichia coli* and *Klebsiella pneumoniae* using Inhibitor –based methods”.**

Increased prevalence of Amp C β lactamase mediated resistance among *E.coli* & *Klebsiella* is of clinical concern. Various phenotypic methods to detect AmpC β – lactamases were evaluated.

5. Dr.Anila A Mathews

- i. **Antimicrobial activity of six plants extracts on multi drug resistant bacteria and *Candida* species”.**

Plant extracts from six plants were taken and antimicrobial activity of them was tested on different drug resistant bacteria and *Candida* species and some plant extracts showed promising results.

- ii. **“Detection of Carbapemases and Metallo Beta lactamase producers in multidrug resistant *Acinetobacter baumannii* and *Pseudomonas aeruginosa* by using DDST and Modified Hodge test”**

Carbapenems are the β lactam antibiotics, presently considered as the most potent agent for treatment of multi drug resistant gram negative bacterial infection. However in the last decade there have been increasing reports of resistance to this life saving antimicrobial in *Pseudomonas aeruginosa* and *Acinetobacter baumannii*. Objective of our study was to find the prevalence of Multi Drug Resistant (MDR) *Acinetobacter baumannii* and *Pseudomonas aeruginosa* among hospitalised patients in the ICU and to detect Carbapemases and Metallo beta lactamase producers among MDR *Acinetobacter baumannii* and *Pseudomonas aeruginosa* using Double Disc Synergy Test and Modified Hodge test. Early detection of MBL producing organisms is a must to prevent the further spread of these in the hospital

2010:

1. Dr.B.Appalaraju

i. Detection of ESBL production and demonstration of CTX – M gene in Klebsiella pneumoniae and Escherichia coli from clinical samples

Escherichia coli and *Klebsiella pneumoniae* are the most common bacteria causing various infections in man, like urinary tract infections. They are managed usually by a group of antibiotics named as cephalosporins large percentage of these bacteria are developing resistance to these drugs by producing enzymes, extended spectrum betalactamases (ESBL) which can destroy the antibiotics. There are some genes which codes for these enzymes called as CTX M, SHV, TME etc. we found CTX M genes in 10 out of 25 of these bacteria by molecular technics ie Polymerase chain reaction (PCR)

ii. Detection of Human Papilloma virus from cervical specimens

Cervical cancer is one of the most common malignancies seen in women worldwide. Some Human papilloma virus (HPV) infections are found to be strong risk factor for cervical cancer. Polymerase chain reaction using consensus HPV primers MY09/MY11, found that none of the 50 patients studied had HPV infection.

2. Dr. Marina Thomas

“Seroepidemiological study of Rickettsial fever in Coimbatore”

This was a pilot study done to find out whether Rickettsial infections are prevalent in Coimbatore. Out of 61 serum samples taken from febrile cases (negative for typhoid and Dengue), 23 were positive for Rickettsial infections by Weil Felix test. Out of this scrub typhus was the predominant type.

3. Dr.S.Parvathi

“Detection of virulence markers among clinical isolates of Coagulase negative Staphylococcus”

Coagulase negative staphylococci were isolated from various clinical samples and their virulence characteristics were tested by hemolysis, slime and opacification of milk agar.

4. Dr.J.Jayalakshmi

“Study of various virulence factors produced by clinical isolates of *Pseudomonas aeruginosa*”

Pseudomonas aeruginosa is one the most common pathogens associated with hospital acquired infections, burns wound infections, respiratory infection and urinary tract infections. The extracellular virulence factors produced by *Pseudomonas aeruginosa* isolated from various clinical specimens were studied.

2011:

1. Dr.B.Appalaraju

i. Determination of Virulence factors of Candida Species isolated from a Tertiary Care Hospital

Candida species of fungi are the commonest cause of opportunistic fungal infections seen in man. *Candida albicans* and *Candida tropicalis* are the predominant species responsible for majority of infections. We studied virulence factors like acid proteinase production, phospholipase production and biofilm formation in different *Candida species*. A total of 23.4%, 17% and 6.3% of *Candida albicans* were positive for the above factors in the same order. Similarly 28.1%, 37.5% and 17.2% of *Candida tropicalis* were positive for the above factors. Other candida species failed to produce these enzymes

ii. To study the biofilm formation and drug resistance of Acinetobacter in clinically isolated samples

Acinetobacter baumannii is a Gram negative bacterial opportunistic pathogen. This survives in hospital environments and accounts for human infections. We studied the drug resistance mechanisms in this bacteria and virulence factors which makes it pathogenic. Drug resistance in these bacteria was mainly due to enzymes which destroy the antibiotics. Result showed 72% carbapenemase producers, 58% were MBL producers and 21.8% were AmpC β - lactamase producers. All 64 isolates of *Acinetobacter baumannii* studied produced.

iii. Characterisation of growth conditions and Antimalasezial activity of 23 plant extracts on Malassezia furfur

Malassezia furfur is the fungus which causes dandruff and other skin infections. To study this fungus one has grows it in laboratory. It is very difficult to grow this organism. We standardized various conditions like media, pH, temperature etc to grow this fungi. Saborauds dextrose agar with corn oil at Ph 6 and 30 c were was found to be good antimalasezial activity was tested with 23 plant extracts of which 6 showed activity. Cinnamon oil was found to be highly active against this fungus.

iv. Evaluation of various physical parameters and different plant extracts on the growth of Malessezia furfur

Malassezia furfur is the fungus which causes dandruff and other skin infections..After standardizing growth conditions for this fungi, antimalasezial activity was tested by disc diffusion and broth dilution methods, with 28 plant extracts,of which 11 showed activity.

This work is important due to the first report of antimetastatic activity of *Coleus forskohlii*, *Sapindus*, *Shankadravaka* and *Allspice* oil.

2. **Dr. Marina Thomas “Characterization of Neisseria species isolated from respiratory tract”**

Neisseria species, a commensal bacteria was isolated from 37% amongst all respiratory tract samples tested. *Neisseria sicca* and *N.lactamica* were the predominant species. Sometimes these commensal bacteria can become invasive and cause endocarditis in patients.

3. Dr.S.Parvathi

“Antimicrobial effect of honey”

This study was done to determine the antimicrobial effect of Indian (dabur, Ayurvedic, wild forest) and other types (Australian, Nectar honey). It was found that Australian honey had the maximum effect against MRSA, *E.coli* and *Pseudomonas* and Indian wild forest honey also had similar effects. This could be made use where honey could be used as a topical application in wound infections.

4. Dr.J.Jayalakshmi

“Faecal carriage of vancomycin resistant enterococci among In – patients in a tertiary care hospital”

Enterococci the commonly isolated organisms are found to develop resistance to vancomycin and colonize in the intestinal tracts of human beings and become reservoirs of nosocomial infections. It is important to identify carriage and isolate the patients. The study showed a VRE prevalence of 9.5% among hospitalized patients.

2012

1. Dr.B.Appalaraju

i. **“Isolation and molecular detection of New Delhi Metallo Beta Lactamases from the member of Enterobacteriaceae”**

Escherichia coli and *Klebsiella pneumoniae* are bacteria, belonging to the family Enterobacteriaceae, common causes of various infections in man. In 2009 these bacteria were found to develop resistance to the most powerful antibiotic like imipenem, meropenem (carbapenems) etc by producing metallo-beta-lactamase enzyme. This enzyme is named as New Delhi metallo-beta-lactamase (NDM). We identified 22 NDM positive bacteria by molecular techniques. Fortunately all these isolates are sensitive to one or two other antibiotics.

ii. **Detection of efflux mediated drug resistance in multi drug resistant *Pseudomonas aeruginosa* by phenotypic and molecular techniques”**

Pseudomonas aeruginosa is one of the most important bacteria that causes hospital acquired infections. Multidrug resistance is found to be very common in this bacteria. We are studying various mechanisms that lead to resistance, particularly efflux mechanism. This is due to various efflux systems particularly Mex AB opr M, which is expressed more in the resistant bacteria. We are studying this efflux by phenotypic and genotypic methods like PCR.

2. Dr. Marina Thomas

“Antimicrobial activities against biofilm formed by Escherichia coli isolates from wound and Urinary Tract Infections”

Escherichia coli isolated from wound and urinary tract is being tested for its susceptibility to Ciprofloxacin and Amikacin by different methods. Ability of amikacin and ciprofloxacin to inhibit biofilm formation is also being tested.

3. Dr. J. Jayalakshmi

“Virulence variability of drug resistant and sensitive clinical isolates of Acinetobacter Baumannii”

Acinetobacter baumannii is an important nosocomial pathogen. The factors that influence the virulence may help in separating the colonizing strains into high and low potential virulent ones. A possible virulence variability exhibited by the multi drug resistant and the sensitive strains of *Acinetobacter baumannii* is studied.

4. Dr. M. Dheepa

“Ability of BD BacTec plus blood cultures bottles versus BacT / Alert blood culture bottles to detect bacterial pathogens in samples containing vancomycin”

Antimicrobials present in blood samples taken from patients undergoing antimicrobial therapy can delay or prevent the detection of bacteremia in blood culture systems. To prevent this, various approaches are employed to remove antimicrobials from blood culture media or otherwise render the drugs inactive against microbial organisms. The (BD) BACTEC 9050 blood culture system utilizes ion exchange and nonionic adsorbent resins to remove antimicrobials introduced by blood samples, while the BacT/Alert blood culture system (bioMerieux) uses activated charcoal to neutralize antimicrobial effects. This study will compare the ability of the two blood culture systems to neutralize the effects of antibiotic at three simulated therapeutic serum levels and to evaluate the time to detection (time to positivity) differences between the two systems.