



**MANIPAL**  
ACADEMY of HIGHER EDUCATION  
(Deemed to be University under Section 3 of the UGC Act, 1956)



GLOBAL  
HEALTH  
PROGRAMS

PROGRAMMES DE  
SANTÉ  
MONDIALE

# Contagion

The annual MAC ID Newsletter

Issue 3 – August, 2019



A publication by

**Manipal Centre for  
Infectious Diseases (MAC ID)**

Prasanna School of Public Health  
Manipal Academy of Higher Education, Manipal

 [macid.mu@manipal.edu](mailto:macid.mu@manipal.edu)

 <http://macid.manipal.edu/>

 0820 2933505

Follow us on

 Manipal Center for Infectious Diseases

 @macidmahe

# Team MAC ID

## Team Members: MAHE



### Dr Kavitha Saravu

Professor and Unit Chief  
Dept. of Medicine, KMC, Manipal  
MAC ID Joint Coordinator, Manipal



### Dr Shrikala Baliga

Deputy Director  
Quality & Compliance, Mangaluru Campus  
Professor  
Dept. of Microbiology, KMC, Mangaluru



### Dr Chiranjay Mukhopadhyay

Associate Dean  
KMC Manipal  
Professor  
Dept. of Microbiology, KMC, Manipal



### Dr Kiran Chawla

Professor and Head  
Dept. of Microbiology, KMC, Manipal



### Dr John Ramapuram

Professor and Head  
Dept. of Medicine, KMC, Mangaluru



### Dr Sneha Deepak Mallya

Associate Professor  
Dept. of Community Medicine,  
KMC, Manipal



### Dr T S Murali

Associate Professor  
Dept. of Biotechnology  
School of Life Sciences, Manipal

## Team Members: McGill University



### Dr Madhukar Pai

Director  
McGill Global Health Programs, Canada  
Director  
McGill International TB Center, Canada  
Professor of Epidemiology  
McGill University, Canada  
MAC ID Joint Coordinator, Canada



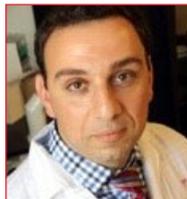
### Dr Nitika Pant Pai

Medical Scientist  
The Research Institute of McGill University Health  
Centre, Canada  
Associate Professor of Medicine  
McGill University Health Centre, Canada  
Researcher, Division of Clinical Epidemiology  
McGill University Health Centre, Canada



### Dr Michael Libman

Director  
J D MacLean Center for Tropical Diseases, Canada  
Director, Tropical Diseases Clinic  
McGill University Health Centre, Canada  
Professor of Medicine  
McGill University Health Centre, Canada



### Dr Cedric Yansouni

Associate Director  
J D MacLean Center for Tropical Diseases, Canada  
Assistant Professor  
McGill University Health Centre, Canada



### Dr Momar Ndao

Director  
National Reference Center for Parasitology, Canada  
Associate Professor of Medicine  
McGill University Health Centre, Canada



### Dr Faiz Ahmad Khan

Director, TB Clinical Services, Montreal Chest Institute  
McGill University Health Centre, Canada  
Respirologist  
McGill University Health Centre, Canada  
Assistant Professor of Medicine  
McGill University Health Centre, Canada



# CONTENTS



## Section I: Epistola

- |  |    |
|--|----|
| 1. Editor's note-Dr Kiran Chawla and Dr Basavaprabhu Achappa         | 04 |
| 2. Joint coordinators message- Dr Kavitha Saravu and Dr Madhukar Pai | 05 |
- 

## Section II: Opus

- |  |    |
|--|----|
| 1. Events organized by MACID                               | 08 |
| 2. Seed grants awarded                                     | 16 |
| 3. McGill Summer Course – Participating Faculty Experience | 17 |
| 4. Student Travel Awards                                   | 21 |
- 

## Section III: Novus

- |                               |    |
|-------------------------------|----|
| 1. Articles by McGill faculty | 26 |
| 2. Articles by MAHE faculty   | 30 |
| 2. Case Reports               | 42 |
| 3. Cross word                 | 51 |

## Section IV: Pictus

- |               |    |
|---------------|----|
| Photo gallery | 54 |
|---------------|----|
- 

## Section V: Laurus

- |                             |    |
|-----------------------------|----|
| MAC ID Faculty achievements | 60 |
|-----------------------------|----|
- 

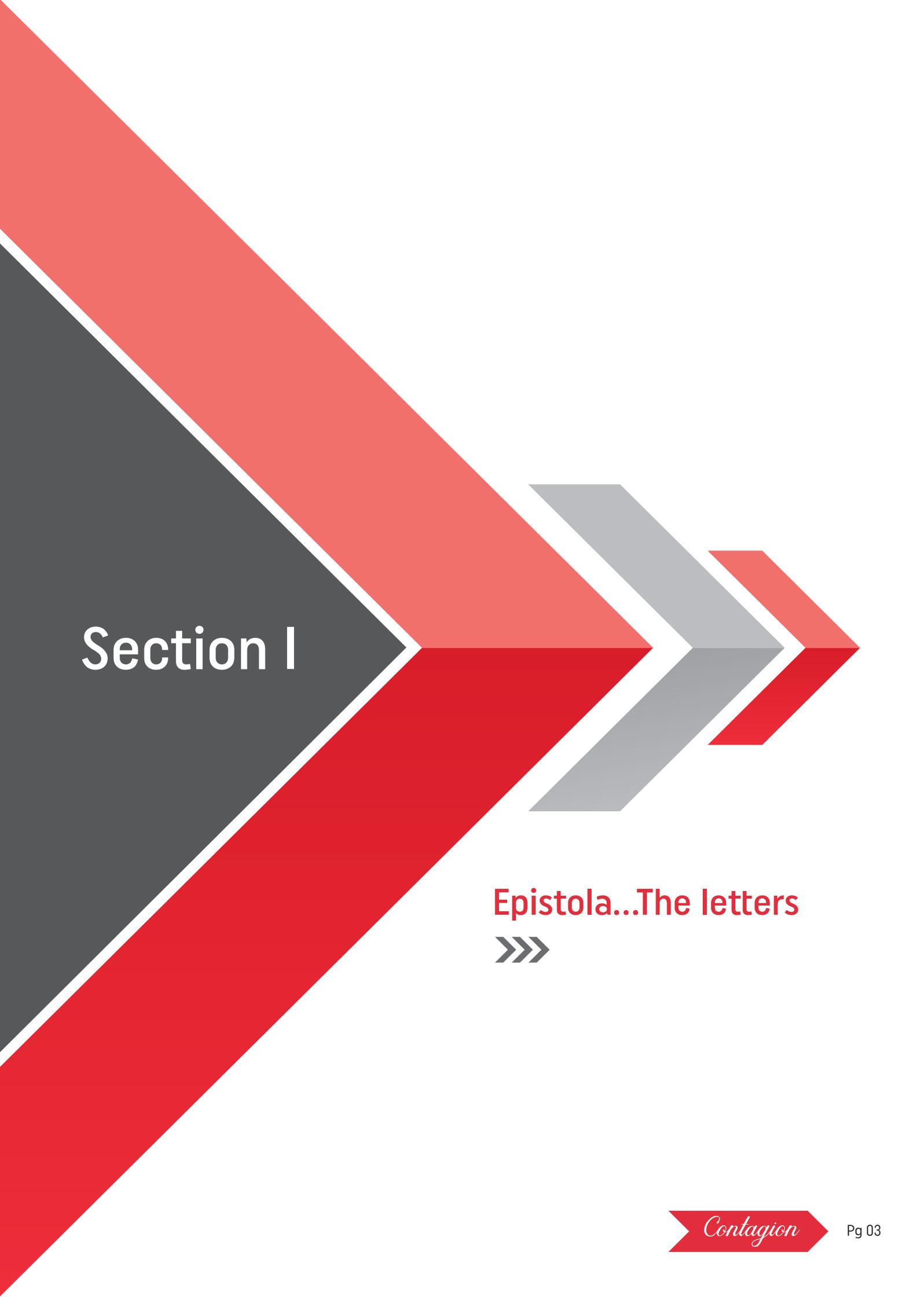
## Section VI: Mustus

- |                                |    |
|--------------------------------|----|
| Upcoming ID conference details | 68 |
|--------------------------------|----|
- 

## Section 7: Numus

- |              |    |
|--------------|----|
| Our Sponsors | 70 |
|--------------|----|





# Section I

Epistola...The letters



## Editor's note



**Dr. Kiran Chawla**

Department of Microbiology  
KMC, Manipal



**Dr. Basavaprabhu Achappa**

Department of Medicine  
KMC, Mangaluru

Dear Readers,

Bringing out the 3<sup>rd</sup> Edition of the newsletter the "*Contagion*" has indeed been a challenging and at the same time a fulfilling experience. When we set out to compile the material for the newsletter we did face a few hurdles and the task appeared daunting when Dr. Kavitha Saravu requested us in early May to be the editors for this year's Newsletter. Being in two different campuses 60kms apart, it was a difficult proposition to formulate a blueprint for our newsletter. But, the work done by previous editors did help us develop the basic structure and also we could meet face to face in Manipal to plan the content.

The *Contagion* this year has messages from our Joint coordinators, brief summary of the events that were held under the aegis of MAC ID beginning with the International Infectious diseases conference held in Mangaluru in August 2018. We had CMEs, workshops and guest lectures from eminent faculty from McGill and various institutes in India. We also celebrated important days like the, World AIDS day, World hospice and palliative care day, CME on Recent Updates in Tuberculosis Management and many workshop's and symposium in both our campuses.

The MAC ID Seed grant for our faculty has been a grand success and we have an ever-increasing number of applicants for the seed grant encouraging them to excel in the field of research. Many of our faculty have been able to successfully apply for intramural and extramural funding for studies in the field of infectious diseases and we are sure this number is set to grow in the coming years.

Some of our members have received awards and presented their work in national and international conferences and our Joint Coordinator has led by example with her presentation on KFD in Munich, Germany. Our students have brought laurels to our university by presenting papers in various conferences and some of them even won awards. MAC ID has encouraged publications in high impact journals and we have started seeing the fruits of labour that has been put in the last couple of years.

In this edition of *Contagion* we have included few topics of importance by our faculty like KFD, Melioidosis, *Candida Auris* and few interesting ID Cases diagnosed and managed by our faculty.

This newsletter wouldn't have been possible without the fabulous effort put up by Ms. Chethana, our administrative staff, in helping us compile all the material we have put in this newsletter. Also, special thanks to Dr. Kavitha and Dr. Madhukar for entrusting this opportunity to be the Editors.

We have done our best to make this Edition's Newsletter pleasurable to read for you all. Do send us your feedback and suggestions so that we can improve the Newsletter further if we get the opportunity again in the future.

## Joint Coordinators Message



**Dr Kavitha Saravu**  
Joint Coordinator MAC ID  
MAHE, Manipal



**Dr Madhukar Pai**  
Joint Coordinator MAC ID  
McGill University, Canada

We are delighted to bring out the 3rd edition of *Contagion*, as we are completing 3rd year milestone of MAC ID, now Manipal Center for Infectious Diseases. Our collaboration with McGill University under Manipal McGill Program for Infectious Diseases (MAP ID) is growing stronger by the year, with exchange of several faculty and trainees from both universities, and successful collaborative research projects. Henry Ford once said "Coming together is a beginning. Keeping together is progress. Working together is success."

The year gone by has been challenging. Global resurgence of measles and unprecedented international spread has exposed the glaring gap in immunization coverage and the growing threat of anti-vaccination movement. Africa is battling with the 2nd largest outbreak of Ebola in history. Zika virus infection apart from causing congenital Zika syndrome and Guillian-Barre' Syndrome, caused severe diseases and fatalities in adults. Children in Bihar continue to suffer due to outbreaks of encephalitis. In our region, we had to cope up with yet another outbreak of Kyasanur Forest Disease, and the threat of Nipah should make us acutely aware of status of our own preparedness to face the challenge these contagions pose. In this scenario of emerging and reemerging infectious diseases, the topics chosen for this year's infectious diseases conference on "Tropical Infections and Global Health" are highly relevant.

In line with our mission, last year our MAC ID members, steered by the core committee and encouraged by MAHE leadership have striven to build regional capacity to face the challenges of infectious diseases by organizing hands on workshops, CME's and successfully organizing an International conference on a variety of themes to propagate knowledge and change practices; Our members are carrying out pilot studies, undertaking collaborative research projects and aim to provide much needed evidence from India. We congratulate all these members who furthered the cause of MACID. Their efforts and achievements and many more creative contributions from MACID members have been elegantly showcased in the 3rd edition of *Contagion*; and we congratulate Dr Kiran Chawla and Dr Basavaprabhu for editing this version of '*Contagion*'. We wish the readers an enriching experience!



# Section II

Opus.....The work so far...



## A) Manipal McGill Infectious Diseases International Conference

11th &amp; 12th August 2018



**Inauguration of Manipal McGill Infectious Diseases International Conference 2018**

From Left to Right: Dr Kavitha Saravu; Dr Poornima Baliga; Dr Vinod Bhat; Dr M Venkatraya Prabhu; Dr Shrikala Baliga



From Left to Right:  
Dr Kayla Iaserson; Prof. Arunkumar Govindakarnavar

The Manipal McGill International Conference 2018 was held on 11th and 12th August, 2018. The conference was inaugurated by Chief Guest Dr Vinod Bhat, Vice Chancellor, MAHE and Guest of Honour, Dr Poornima Baliga, Pro Vice Chancellor, MAHE.

Dr M V Prabhu, Dean, KMC, Mangalore welcomed the gathering. Dr Kavitha Saravu presented a report about MAC ID activities for the year 2017-2018. Dr Vinod Bhat stressed on the interdisciplinary interaction between various departments, importance of public health and translational research. The MAC ID Newsletter "*Contagion*" along with the abstract book of the conference was released during the ceremony.

Two CMEs were conducted parallelly, with about 125 registrations each. CME 1 was on "Hospital Infection and Antimicrobial Stewardship. The 1st Session in the CME was on CLABSI which was deliberated upon by Dr OC Abraham, Dr Balaji. Dr Abdul Ghafur, one of the pioneering author of "The Chennai Declaration", spoke on the Chennai Declaration. This was followed by a Panel Discussion on Antimicrobial Stewardship – Practical guide moderated by Dr Chiranjay Mukhopadhyay with panellists being Dr Manjusha Narayanan, Consultant Microbiologist, Newcastle Upon Tyne, NHS, England and Dr Vandana K E Professor, Microbiology, KMC Mangalore and Chair Antimicrobial Stewardship along with Dr Ghafur and Dr Chakrapani, Professor, Medicine, KMC Mangalore. CME 2 was on Diagnostics- Essence of Infectious Diseases. The 1st session in this CME was on the Lancet Commission on Infectious Diseases by Dr Sanjay Pai, followed by Dr Sandhya Kabra, Addl Director, NCDC who spoke on Strengthening District Labs. Dr Gayathri spoke on the utility of Gene Expert in a tertiary Care Hospital. The 2nd Session in this CME was on Advanced Diagnostics. Dr Chand Wattal, Professor and Chairman Consultant, Sir Gangaram Hospital and Research Centre spoke on MALDO-ToF and Bio-Fire, Dr Ameeta Joshi, HOD, Microbiology, Sir J J Hospital, spoke on Advanced Diagnostics in TB and Dr Kayla Iaserson, Director, CDC, India, spoke on Diagnosis of Acute Febrile Illness.

The MAC ID International Conference 2018 with the theme- Unifying all to overcome the Challenges of Tropical Diseases began with the KEY NOTE address by Dr O C Abraham, HOD, Medicine, CMC, Vellore, on Topical Issues in Tropical Diseases. He spoke at length on tropical diseases of importance in India including Typhoid, Dengue and Scrub Typhus. Parallel adult and paediatric sessions were held, which discussed the burning topic of infection with management of gram-negative bacterial infections, Nipah virus, Childhood TB and Management of Dengue in Children. Antimicrobial surveillance network was presented by Dr Balaji V, Professor, CMC, Vellore and Dr Bhaskar Shenoy spoke on Resurgence of Diphtheria.

On Day 2 a very interesting talk on Ethics and Grant Proposal writing was delivered by Dr Sanjay Pai, Consultant Pathologist, Columbia Asia, Bangalore and Dr Unnikrishnan G, Associate Dean, KMC Mangalore. Management

of gram-positive infections by Dr Rajiv Soman, Consultant ID Physician, Pune discussed case-based management of infections by Staphylococcus aureus, MRSA and Enterococci. Dr Sharmila Sengupta, Consultant Microbiologist, Tan Tock Seng Hospital, Singapore spoke on heterogeneity of CRE.

Dr V Ravi, Professor and Head of Neurovirology, NIMHANS, Bangalore, delivered an interesting talk on "Vector-borne viral diseases". Technology in Medicine – a new and emerging field had innovative applications of technology for surveillance of Malaria and its impact on the reduction of active cases and the N –TB app which helps the patients to monitor nutrition in TB by Dr B S Baliga, Prof Emeritus, KMC Mangalore and Dr Anurag Bhargav, Professor, Medicine, Yenepoya Medical College, Mangalore.

A quiz for postgraduates was organised by Dr Deepak Madi and Dr Basava Prabhu, Associate Professors of Medicine, KMC Mangalore. The Conference ended with a very interactive Panel discussion on how to improve Quality of care in TB moderated by Dr Ashwin Kumar, Professor, Community Medicine, KMC, Manipal.

The MAC ID International Conference succeeded in its mandate to bring together experts from various fields in Medicine with special interest in infectious diseases. In all about 98 posters and 12 oral presentations were delivered. It was the first time that e posters were used which was well appreciated. The conference and CME was given 4 hours of credit points by Karnataka Medical Council.

## B) World Hospice and Palliative Care Day

2nd October 2018



From Left to Right: Dr Naveen Salins; Dr Avinash Shetty; Dr Poornima Baliga, Dr Pragnya Rao, Mr C G Muthana; Dr Chiranjay Mukhopadhyay



Professor Ganpathy, CEO of JASCAP foundation, Mumbai

Department of Palliative Medicine and Supportive Care organized a CME on "Supportive Care in HIV/AIDS" on World Hospice and Palliative Care Day (WHPCD) 2018 in association with Manipal McGill Center for Infectious Diseases. CME was conducted at Shirdi Sai Baba Conference Hall in afternoon of 13th Oct 2018. Dr Maria Ekstr and Prof. Ganpathy KV were invited for guest lecture. CME was inaugurated by Dr Poornima Baliga, Pro Vice Chancellor of MAHE. Dr Baliga emphasized on need of Palliative care in the community and awareness of Palliative care among clinicians. Inauguration and launch of theme for WHPCD was also marked by presence of Dr Pragna Rao, Dean, KMC, Manipal, Mr. C. G. Muthana, Chief Operating Officer, Kasturba Hospital, Manipal and Dr Avinash Shetty, Medical Superintendent, Kasturba Hospital, Manipal. Dr Maria Ekstrand, Professor of Medicine, University of California and San Francisco took plenary session on "Stigma as a barrier to access care in HIV/AIDS". Professor Ganpathy, CEO of JASCAP foundation, Mumbai highlighted "Role of volunteer counsellor in care of person living with HIV/AIDS and their families" in another plenary session.

CME was attended by faculty, PhD scholars and undergraduate and postgraduate students of KMC, Manipal College of Nursing and Prasanna School of Public Health. Dr Naveen Salins moderated the CME. He mentioned the contribution of Cicely Saunders in Hospice movement in UK and European countries. In the conclusion, Dr Salins expressed sincere thanks for faculties, audience and marketing department for smoothly organizing the CME by Department of Palliative Medicine and Supportive Care.

## C) Workshop on Standard methods in evaluation of antimicrobials

10th & 11th December 2018



◀◀◀ Inauguration of Workshop on Standard methods in evaluation of antimicrobials

From Left to Right: Dr Raghu Chandrashekar, Dr Kavitha Saravu, Dr C. Mallikarjuna Rao

Participants of Workshop on Standard methods in evaluation of antimicrobials



A two-day workshop on "Standard methods in evaluation of antimicrobials" was organized by the Department of Pharmaceutical Biotechnology (DPBT), Manipal College of Pharmaceutical Sciences (MCOPS), MAHE in collaboration with Manipal McGill Centre for Infectious Diseases (MAC ID), Prasanna School of Public Health (PSPH), Manipal on 10th and 11th December, 2018 at PG Seminar Room, Department of Pharmaceutical Biotechnology. The chief guest, Dr Kavitha Saravu, in her address to the gathering spoke on the emergence of antibiotic resistance strains and stressed upon the "3S's" indicating speed, scale and skill to achieve results. Dr. C. Mallikarjuna Rao, Principal, MCOPS, MAHE who presided over the inaugural function in his briefing, spoke on the role of pharmacists in tackling the menace of antibiotic resistance. The vote of thanks was proposed by Dr. J Venkata Rao, Professor, DPBT, MCOPS. The two-day workshop saw talks from Dr. J. Venkata Rao, Dr. Raghu Chandrashekar, Dr Jesil Mathew and Dr. Divyashree MS (Assistant Professor, MIT) on topics related to antimicrobial susceptibility testing, procurement, culturing and preservation of microorganisms. The workshop also facilitated the participants to gain hands on experience in various techniques employed in microbiology. The workshop had an overwhelming response with participants coming from Karnataka, Kerala & Tamil Nadu.

Dr. J Venkata Rao, in his concluding remarks, expressed his satisfaction over the proceedings of the workshop and highlighted the importance of organizing such workshops. Dr. M Sreenivasa Reddy and Dr. J Venkata Rao distributed the certificates to the participants. The participants in their feedback expressed their happiness in receiving hands on experience in various microbiological techniques and gave their valuable suggestions. Dr. Raghu Chandrashekar, in his vote of thanks duly acknowledged the help from people and made a special mention about the contributions from research scholars and PG students and certificate of appreciation was distributed by Dr. J Venkata Rao. Ms. Sridevi, research scholar, the MC for inaugural and valedictory functions, conducted the proceedings effectively.

## D) CME on Recent Updates in Tuberculosis Management

9th & 12th January 2019



Panel discussion

From Left to Right: Dr. Ashwini Kumar; Dr Chidananda Sanju S V; Dr Amithash M P; Dr Kiran Chawla; Dr Kavitha Saravu



Dr Chidananda Sanju S V,  
District tuberculosis officer, Udupi

The two day CME on Recent Updates in Tuberculosis Management was organized by Manipal McGill Center for Infectious Diseases & District Health Society, TB Division, Udupi in association with Manipal College of Nursing, Department of Medicine, KMC Manipal & Department of Community Medicine, KMC Manipal.

Half day CME's were held on two days on 9th and 12th January 2019. On 9th CME was held at Nalanda Class room, Kasturba Hospital, Manipal. The event was attended by post graduates and faculty of Medicine. On 12th, the CME was targeted towards Nursing faculty, PhD scholars and delegates from various departments. CME sessions were attended by 55 and 65 students, faculty and research scholars respectively on two days.

Dr Shashidhar, Professor and Head of Community Health Nursing, MCON welcomed the gathering. CME speakers, Dr. Ashwini Kumar (RNTCP, Nodal Officer, KMC Manipal, Additional professor, Department of Community Medicine, KMC, Manipal), Dr Kavitha Saravu (Professor and Unit Chief, Department of Medicine, KMC, Manipal & Joint Coordinator MAC ID, PSPH, MAHE, Manipal), Dr Aswini Kumar Mohapatra (Professor, Dept. of Pulmonary Medicine, KMC Manipal) and Dr Amithash M P (Assistant Professor, Dept. of Pulmonary Medicine) highlighted various topics on Tuberculosis. The CME commenced with talks on "Integrated TB Diagnostics algorithms", "Management of Tuberculosis, "How to protect health care workers from TB" followed by a panel discussion on "Bridging the Know Do Gap in Tuberculosis Prevention and Management" on both the days. The panel discussion was moderated by Dr Cynthia Amrutha (Assistant Professor, Dept. of Medicine, KMC, Manipal) and the Panelist were Dr Chidananda Sanju S V, Dr Kavitha Saravu, Dr Aswini Kumar Mohapatra, Dr Amitash, Dr Kiran Chawla (Professor & Head, Dept. of Microbiology, KMC Manipal), Dr Vishnu Prasad (Associate Professor, Dept. of Microbiology, KMC Manipal), and Dr Ashwini Kumar.

Dr Chidananda Sanju S V, District tuberculosis officer, Udupi was the Chief Guest and Dr Judith Angelitta Noronha, Associate Dean, Manipal College of Nursing was Guest of Honour for the Valedictory function. Dr Chidananda Sanju stressed on the role of Medical Colleges and nursing community towards TB elimination goal of Government of India. Dr Kavitha gave the overview of the CME and Dr Ashwini Kumar, Additional professor of Community Medicine, KMC Manipal proposed the vote of thanks. Dr Latha T, Assistant professor, Department of Surgical nursing, MCON hosted the event.

## E) Guest Lecture on " Will SmartApps Plug Health Service Delivery Gaps? Evidence from South Africa, Canada and India"

11th March 2019



Dr Nitika Pant Pai, Associate Professor of Medicine, McGill University Divisions of Clinical Epidemiology & Infectious Diseases Medical Scientist, The research institute of the McGill University Health Centre, Canada



Participants of Guest Lecture on " Will SmartApps Plug Health Service Delivery Gaps? Evidence from South Africa, Canada and India

A guest lecture was organized by Manipal McGill Center for Infectious Diseases in association with Department of Community Medicine and Department of Medicine, Kasturba Medical College, Manipal on 11th March 2019. Dr. Nitika Pant Pai who is a core committee member of MAC ID from McGill University delivered a guest lecture on the topic "Will Smart Apps Plug Health Service Delivery Gaps? Evidence from South Africa, Canada and India". Dr Pai's talk focused on product innovations for self-testing, multiplex testing, rapid point of care testing and integrated sexual and reproductive services. She highlighted the evidence from implementation research of her innovative app based solutions in distinct populations across Canada, India and South Africa. Dr Kavitha Saravu, Joint Coordinator of MAC ID welcomed the gathering. The event was attended by 35 participants including postgraduates, PhD scholars and faculty from various institutions of MAHE. Finally, the session was concluded by a vote of thanks by Dr. Sneha D Mallya, Associate professor Department of Community Medicine, KMC Manipal.

## F) Workshop on Polymerase Chain Reaction for Diagnosing Infectious Pathogens

1st March 2019



From Left to right: Dr. T.S. Murali , Dr. Gopinath;  
Dr. K. Satyamoorthy.



Participants of Workshop on Polymerase Chain Reaction  
for Diagnosing Infectious Pathogens

The Hands-on workshop on "Polymerase Chain Reaction for Diagnosing Infectious Pathogens" was organized by School of Life Sciences, MAHE in KMC Attavar Hospital, Mangalore on 1st March 2019 with the support of Manipal McGill Center for Infectious Diseases. A total of 22 participants including researchers from Kasturba Medical College Manipal, Manipal Institute of Technology, Manipal, Manipal College of Dental Sciences, Manipal, Manipal College of Pharmaceutical Sciences, Manipal, Melaka Manipal Medical College, Manipal, Mangalore University, St. Agnes College, Mangalore, SDM College, Ujire participated in the one-day workshop. We had resource persons from School of Life Sciences (SLS), MAHE, Manipal and Kasturba Medical College, Mangalore. The workshop started with registration of participant followed by a talk by Dr. T.S. Murali on the topic "Polymerase Chain Reaction: Techniques and variations". This was followed by a talk by Dr. Shrikala Baliga on the topic "Molecular techniques in infectious disease detection". After a tea break, the participants had a hands-on practical session on performing PCR and PCR-RFLP. Followed by lunch, Dr. Saadi Abdul Vahab presented a talk on "Applications of PCR to diagnose infectious organisms". This was followed by a bioinformatics session by Dr. Bobby Paul on "Designing of primers, performing PCR and analysing sequences". The participants then continued with the practical session to observe the results obtained. In the evening, there was high-tea, and the valedictory session with Dr. Gopinath, Retired Senior Scientist from MAHE being the chief guest. Dr. K. Satyamoorthy, Director, School of Life Sciences requested the participants to actively engage with researchers in School of Life Sciences towards any other related scientific activities. The certificates were distributed by Dr. Gopinath to all the participants. Overall, the feedback from the participants suggested that the lectures provided a clear and detailed description on performing a PCR and their associated various techniques as well as provide specific information on utilizing these techniques towards studying infectious organisms.

## G) Safe Travel Symposium

23rd March 2019



From Left to Right: Dr Avinash Shetty; Mr C G Muthana; Dr Poornima Baliga; Dr Pragna Rao; Dr Kavitha Saravu; Dr Chythra Rao



Organizing team and Speakers of Safe Travel Symposium

The Symposium was inaugurated by Dr. Poornima Baliga, Pro Vice Chancellor-Faculty of Health Sciences, MAHE, Manipal, Dr. Pragna Rao, Dean KMC, Manipal, Mr CG Muthana, Chief Operating Officer, Kasturba Hospital & Dr Avinash Shetty, Medical Superintendent, Kasturba Hospital, Manipal.

The welcome address was given by Dr. Kavitha Saravu, Professor, Dept. of Medicine and Joint co-ordinator Manipal McGill Centre for Infectious Diseases. Dr Avinash Shetty provided an overview of the symposium & the Travel Clinic at Kasturba Hospital. The Travel Medicine Clinic Flyer was released by the dignitaries. Dr Poornima Baliga made the presidential remarks & discussed the scope of the travel clinic. Dr Chythra R Rao, Associate Professor, Department of Community Medicine, at KMC, Manipal, Co-ordinator for Center for Travel Medicine & Organizing secretary of the symposium delivered the vote of thanks.

The symposium was attended by 40 delegates which included postgraduates & faculty of various departments & institutions. Dr Chythra elaborated the need for a Travel clinic & the preventive services, hazards associated with long distance travel, role of preventive vaccinations & chemoprophylaxis for travellers. Dr Swati Rajagopal explicitly discussed the infectious disease threats faced by adult travelers & the need for tailor made interventions based on travel itinerary. Dr Shashikiran discussed common comorbidities like diabetes, hypertension, cardiac conditions and the risks associated & preventive strategies for travelers with these conditions. Dr Asha Hegde discussed on infectious disease threats & mitigation among paediatric travelers. Dr Pasi discussed in detail about International health regulations, mandatory vaccinations & quarantine, role of APHO, existing Acts & guidelines.

The Panel discussion on international travel risks dwelled on the specific threats like airborne infection control for tuberculosis in aircrafts, disinsection of aircrafts for malaria, quarantine principles, need for inclusion of travel health in the medical curriculum, disease transmission risks at porous land borders & sea ports. The sessions were well appreciated with good discussion among the resource persons & delegates.

## H) CME on Outbreaks of emerging and re-emerging infections

30th March 2019



**Inauguration of CME on Outbreaks of emerging and re-emerging infections**

From Left to Right: Dr Vidyalakshmi K; Dr Kavitha Saravu;  
Dr. Surendra Shetty; Dr. Unnikrishnan; Dr.Ethel Suman



**Organizing team of Outbreaks of emerging and re-emerging infections CME**

The CME on "Outbreaks of emerging and re-emerging infections" was held on March 30th 2019 at Mangalore campus in association with Manipal McGill Center for Infectious Diseases. The program started with a talk by Prof. Arunkumar G, Director of Manipal Institute of Virology, MAHE on "Monkey Fever Returns" wherein he gave a talk on the recent outbreak of Kyasanur Forest Disease (KFD), the unusual symptoms, the risk factors, lab diagnosis and epidemiological aspects.

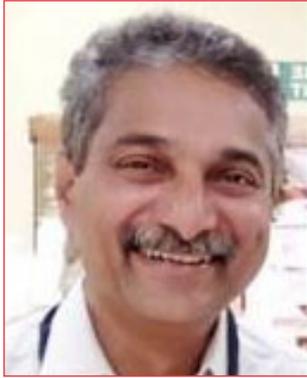
Formal inaugural function followed with the welcome address by Dr.K Vidyalakshmi, Prof and HOD. The Pro Vice Chancellor of MAHE Mangalore Campus Dr. Surendra Shetty inaugurated the CME by lighting the lamp and addressing the gathering. Dr. Unnikrishnan, Associate Dean was the guest of honor and delivered his message. The recipient of 6th Dr.N.C.Ananthakrishna Endowment Oration by Dr Raghavendra D. Kulkarni, Professor and Head of Microbiology, SDM College of Medical Sciences and Hospital, Dharwad was felicitated during the program. Dr. Ethel Suman, Associate Professor and Joint Organizing Secretary of the CME proposed the vote of thanks. Dr. Smrithy compered the entire program. The inaugural program was followed by the oration by Dr. Raghavendra D Kulkarni on the topic "Emerging and Re-emerging contagions-Trends and Scenario".

Dr. Mohan Papanna, Public Health Specialist (Infectious diseases and One Health), Department of Global Health Protection, US CDC, India Office, Embassy of United States of America, New Delhi spoke on "Outbreaks are inevitable, How prepared are we"? Followed by talk on "Current scenario of Diphtheria in India and the expectations" from Clinical Microbiologists by Dr. Naveen Kumar, PhD, FLS (Lon). Scientist-C, ICMR (Ad-hoc), Christian Medical College, Vellore. The interactive session was informative, especially with regard to the importance of vaccination in adolescents and the present scenario of re-emerging diphtheria in adults. Dr John T Ramapuram, Professor & Head, Dept of Medicine, Kasturba Medical College, Mangalore spoke on Swine flu under the catchy title "The Pig that Flu".

The scientific deliberations witnessed over 104 delegates from all over Karnataka. The CME acquired good feedback from the delegates and was a grand success.

## 2. Seed Grants Awarded

Awardees Name & Department	Title of the project
<p><b>Dr Dhanashree B</b> &gt;&gt;&gt; Dept. of Microbiology KMC, Mangaluru, MAHE</p>	 <p>Detection of common diarrheagenic bacterial and viral pathogens in faecal samples of paediatric by Polymerase Chain Reaction</p>
<p><b>Dr Sridevi HB</b> &gt;&gt;&gt; Dept. of Pathology KMC, Mangaluru, MAHE</p>	 <p>Utility of serum procalcitonin and CD64 ratio expressed on neutrophil, lymphocyte and monocyte subsets in diagnosis of early onset neonatal sepsis</p>
<p><b>Dr Chythra Rao</b> &gt;&gt;&gt; Dept. of Community Medicine KMC, Manipal, MAHE</p>	 <p>Seasonal trends in microbial quality of community water samples and perspectives about antibiotic use and misuse in the community</p>
<p><b>Dr Sonal Sekhar</b> &gt;&gt;&gt; Dept. of Pharmacy Practice MCOPS, MAHE</p>	 <p>Vitamin D Supplements in Diabetic Foot Infection: A Prospective Observational Study in a Tertiary Healthcare Facility</p>
<p><b>Dr Jesil Mathew A</b> &gt;&gt;&gt; Dept. of Pharmaceutical Biotechnology MCOPS, Manipal MAHE</p>	 <p>Design and Evaluation of a Nanogel formulation for Biofilm based burn Infections</p>
<p><b>Dr Shashidhar V</b> &gt;&gt;&gt; Dept. of Microbiology KMC, Manipal, MAHE</p>	 <p>Screening for Abacavir Hypersensitivity by DNA Microarray among HIV sero-positive adult patients in a tertiary care hospital</p>

**Dr. John Ramapuram**

Professor & Head  
Department of Medicine  
Kasturba Medical College, Mangaluru.

It was a great opportunity to have attended the summer course in infectious diseases at McGill University. I thank MAHE and McGill University for the same. Along with me three more colleagues from MAHE had attended the summer course. We attended 4 different courses during the two weeks. The course was attended by delegates from more than 50 countries, and they were all from different walks of life.

The first course was about Global Health Diagnostics. Dr. Nitika, Dr. Cedric were the course Directors. This aspect was totally new to me. Even though as clinicians we are the end users of this diagnostics, I was surprised that we had never been exposed to the same.

The second course was conducted by Dr. Makeda and Dr. Erika. They guided us through the entire program on anti-microbial resistance and stewardship. This will definitely help us in setting up a proper antibiotic stewardship in our Institution.

Dr. Madhukar Pai was the course director for the courses in second week. The session by TB survivors (recovered TB patients) made me change my views about them and made me realise that we need to give them more than just medicines. They also discussed about the Bedaquiline based regimen (ongoing clinical trials) for MDR-TB. The new diagnostic tools in the field of TB was highlighted which was really interesting. The passion that Dr. Madhukar Pai has towards the management of Tuberculosis is worth emulating if one can.

We had a grand tour of the hospitals attached to McGill University conducted by Dr. Cedric. He took time off from the Hospital just to show us the Institution. We thank him immensely for the same. We also thank Mr and Mrs. Pai for hosting us in their home for lunch.

The team MAHE – Dr. Deepak, Dr. Sevitha and Dr. Ashwini was just wonderful to be with. The discussions and the arguments that we had, the Indian food, and the bonding that we had together will always remain with me as warm memories.

Anyone who visits McGill University should not come back without visiting Niagara waterfalls. It is really worth visiting.

We should never be a frog in a well, thinking that the entire world is that well. We must visit interesting Institutions across the world and learn new things from there and ensure that we apply it in our Institution, and thereby make it a better one.

Finally, these courses have made me realize that there is much more to be done!



**Dr Deepak R Madi**

Associate Professor  
Department of Medicine  
Kasturba Medical College, Mangaluru

At the outset, let me thank MAHE and Manipal centre for Infectious Disease (core committee) for having provided me an opportunity to attend the summer course in infectious disease at McGill University. Delegates from more than 50 countries attended this course. I attended four courses in the summer institute. These courses provided me an insight about the new developments in the field of ID.

Dr. Nitika, Dr. Cedric, Dr. Makeda and Dr. Erika were the course directors for the courses in first week. I interacted with subject experts in the field of anti-microbial resistance and global health diagnostics during the first week. We felt the need to set up an anti-microbial stewardship programme in our institute after listening to lectures in week one.

Dr. Madhukar Pai was the course director for the courses in second week. The session by TB survivors (patient voices) was an eye opener. Bedaquiline based regimen (ongoing clinical trials) for MDR –TB was discussed. I realised the importance of the diagnostic tools in the field of TB. The passion that Dr Pai has towards TB is mind blowing.

A special thanks to Dr. Cedric who gave a tour of hospitals attached to McGill university despite his busy schedule. A special thanks to Mr and Mrs. Pai for hosting us in their house on the eve of India Pakistan cricket match.

This trip would have been boring without team Manipal – Dr. John, Dr. Sevitha and Dr. Ashwini. You guys are a great company. Apart from academics we also explored Montreal and Toronto. Anyone who goes to Canada must visit the Niagara falls. I strongly recommend seeing the Niagara in the night so that the firework display can be enjoyed.

Finally, "Travel makes one modest. You see what a tiny place you occupy in the world." -Gustav Flaubert. This is what happens to you when you visit the McGill world.



**Dr Sevitha Bhat**

Associate Professor  
Department of Microbiology  
Kasturba Medical College, Mangaluru

I was selected to attend the Summer course training at Mc Gill University from June 10th -21st 2019. It was truly an enriching experience for all of us.

We reached Montreal on 9th June after a long journey. The accommodation was arranged in McGill New residence Hall, Avenue Da parc. We explored the McGill campus and Centre Mont -Royal.

The first course was on Global health diagnostics. We realized that technology has emerged with focus on multiplex platforms and point of care testing. The interesting fact was that the participants were from diverse backgrounds. We got to listen to product developers. The session on essential diagnostics list was good. The Tech pitch session was great with the companies presenting their product ideas We got to interact with participants from over 50 countries.

The third day started off with Antimicrobial resistance, the global overview of the problem was presented. The possibility of Rapid diagnostics as a solution to detect the problem was stressed on. I was fortunate to be a panelist on 2 sessions on critical diagnostic needs of AMR and challenges and opportunities for laboratory strengthening in resource poor countries, the challenges being lack of trained staff, infrastructure, maintaining quality. Opportunities being Research and Development in automation and requires more area wise development: Specialization.

The third course was on Advanced TB diagnostics. We got to listen to the testimony of TB survivors, a nice initiative. Emphasis was on to scale up the WHO endorsed diagnostics in resource poor countries. I learnt about some of the new diagnostic tools: Urine LAM assay and role of sequencing. I learnt about the new TB drugs, Human centered design in TB care was fascinating. I was impressed the way Artificial intelligence is slowly creeping in data interpretation and decision making. Importance of Advocacy and media in TB care was stressed upon. The discussion on GenXpert was good with many of our queries getting addressed.

The fourth session was on Quality of TB care. The scenario in rural settings was miserable.

We got a chance to explore a bit of Montreal. The weather was pleasant. We took a Hop in Hop off tour of the city. 15 minutes Morning walk to the venue daily was refreshing. We used to barge into Singhs palace and LeTaj in the evenings for our favourite Indian food. We visited the Mont Morency falls and Quebec town on Saturday. We took a tour to Niagara Falls as well.

We could watch the thrilling India Pakistan match with team India at Dr Madhukar Pai's house. Thanks to Dr Madhukar and Nitika Pai for being wonderful hosts. We are grateful to Dr Cedric Yansouni for the evening treat and taking us to Royal Victoria Hospital. We were impressed with the infrastructure. Thanks to Mikashmi, Emily and Paulami for giving us good company. I am grateful to Ms. Kristin from Global health systems for taking care of our needs.

I was lucky to be with Dr John Ramapuram, Dr Deepak Madi and Dr Ashwini Kumar. A great company indeed.

Overall it was an enriching experience. I am grateful to Manipal Academy of Higher Education, Mc Gill university especially the joint coordinators: Dr Kavitha Saravu and Dr Madhukar Pai for giving me this wonderful opportunity.

The academic feast and trip will be cherished forever by me.



**Dr Ashwini Kumar**

Additional Professor  
Department of Community Medicine  
Kasturba Medical College, Manipal

It was my first visit to Canada and was really looking forward to visit McGill University at Montreal to have a glimpse of remarkable work being done there. I am thankful to the selection committee and the Joint Coordinators, MACID for the opportunity to visit Montreal for summer course. Registration process was very easy and simple, excellent support extended for registration, travel and accommodation.

On our arrival at Montreal, we checked into accommodation provided it was close to summer course venue and very comfortable. The first course I had opted was on Global health diagnostics. The course coordinators and faculty, Madhukar Pai, Nitika Pant Pai, Cedric Yansouni, Christine Rousseau, Makeda Semret, Dao Nguyen and Jennifer Osborn were very resourceful and approachable. The Course was very interactive and informative; beginning the day with interactive lectures and working out details for a probable collaborative proposal in the afternoon sessions. Diverse participants from across the globe and from diverse, multi-cultural backgrounds included clinicians, public health professionals, microbiologists, product developer, programme officers, added flavor to scientific deliberations.

During the second week, the course on Advanced TB Diagnostics largely focused on the neglected killer disease of lower and middle income countries. The core course faculty, Madhukar Pai made all efforts in bringing together seasoned Diagnostic specialists and discuss latest diagnostic modalities available and in pipeline for emerging infectious diseases particularly for Tuberculosis.

Interactions with participants from various countries during tea, lunch break helped me to understand the practical public health issues politico-social, cultural interference in implementation of health programs beside poor financial and human resources allocation in LMICs.

Apart from academics, the evening rounds with Dr John sir, Dr Deepak and Dr Sevitha Bhat around the city, visit to old port area was amazing. The weekend trip to Quebec City by road was awesome.

I strongly recommend these courses to researcher, Academician, Policy maker and administrators and ever thankful to Dr Kavitha Saravu, Dr Madhukar Pai and MAC ID collaboration for giving me this opportunity.

## 4. Student Travel Awards



### Divya Gandrala

Post Graduate, Department of Medicine, KMC Manipal

Guided by **Dr Kavitha Saravu**, Professor, Department of Medicine, KMC Manipal

Title: Determination of severity, in- hospital outcomes and Recurrences in Malaria: A Prospective cohort study from a tertiary care center

Won first prize in Oral Presentation at 8th Clinical Infectious Diseases Society Conference - CIDSCON -2018, held at CMC Vellore, Tamil Nadu from 16th-18th August, 2018



### Shivani Shenoy K

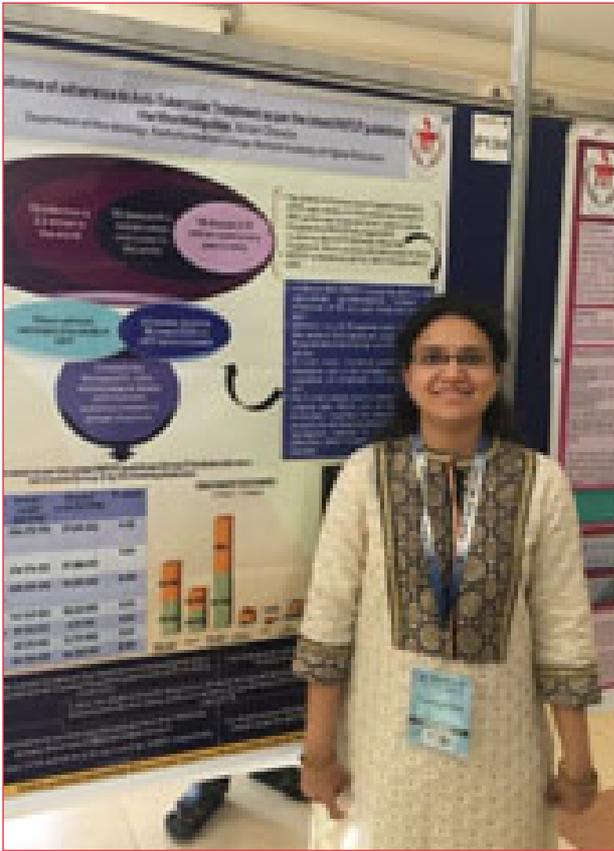
Final year MBBS, KMC Manipal

Guided by **Dr Chythra Rao**, Associate Professor, Department of Community Medicine, KMC Manipal

Title: Knowledge, attitude and practices about Dengue Fever transmission and prevention in rural community

Oral Presentation at SRMC OPTIMUS -2018, held at Chennai, India from 30th July – 01st August, 2018





»»» **Haritha Madigubba**

Post Graduate, Department of Microbiology,  
KMC Manipal

Guided by **Dr Kiran Chawla**, Professor & HOD,  
Department of Microbiology, KMC Manipal

Title: Importance of Treating Tuberculosis Patients  
As per latest RNTCP Guidelines

Poster Presentation at 8th Clinical Infectious  
Diseases Society Conference - CIDSCON -2018,  
held at CMC Vellore, Tamil Nadu from 16th-18th  
August, 2018



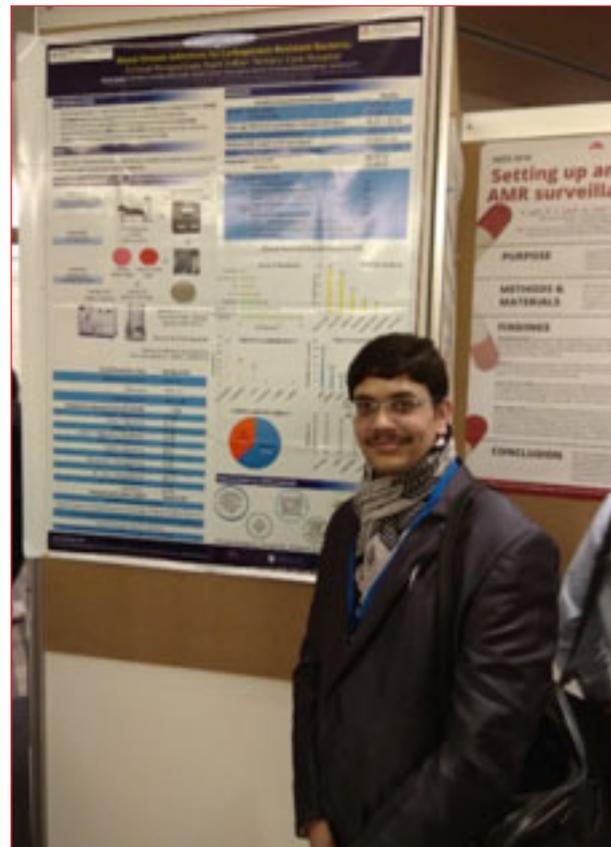
»»» **Rohit Gupta**

Post Graduate, Department of Microbiology,  
KMC Manipal

Guided by **Dr Vandana K E**, Professor, Department  
of Microbiology, KMC Manipal

Title: "Blood Stream Infections by Carbapenem  
Resistant Bacteria: Critical Perspectives from  
Indian Tertiary Care Hospital"

Poster Presentation at 7th Meeting of emerging  
Infectious Diseases, held at Vienna, Austria from  
09th-12th November, 2018





»»» **Rahul Garg**

Post Graduate, Department of Microbiology,  
KMC Manipal

Guided by Dr Chiranjay Mukhopadhyay, Professor, Department of Microbiology,  
KMC Manipal

Title: Source of Bacterial Infections And Its Impact On Sepsis Related Outcome: A  
Prospective Observational Study From ICU's Of A Tertiary Health Care

Oral Presentation at South Zone Critical Care conference -2018, held at Mysuru,  
India from 1st-2nd September, 2018



»»» **Sufyan Ibrahim**

3rd year MBBS, KMC Manipal

Guided by **Dr Chiranjay Mukhopadhyay**, Professor, Department of Microbiology,  
KMC Manipal

Title: Hunt for the source: Outbreak of Pseudomonas spp in Burns ICU

Received consolation prize in the poster presentation at 5th International  
Medical Challenge, Chiang Mai, Thailand – 2018, held at Chiang Mai City, Thailand  
from 09th – 12th November, 2018



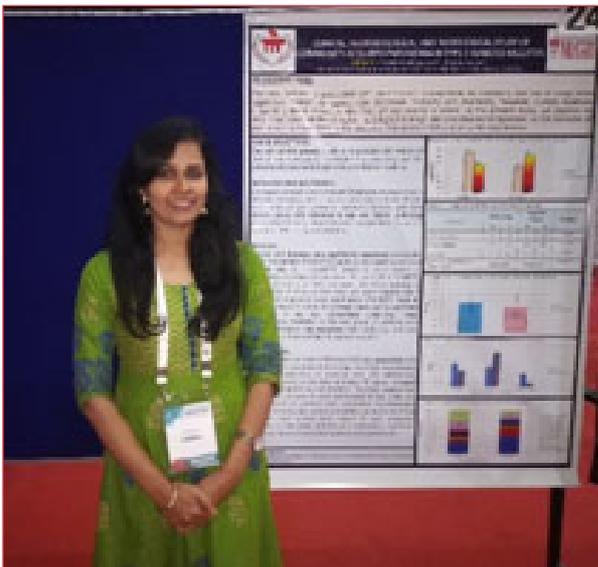
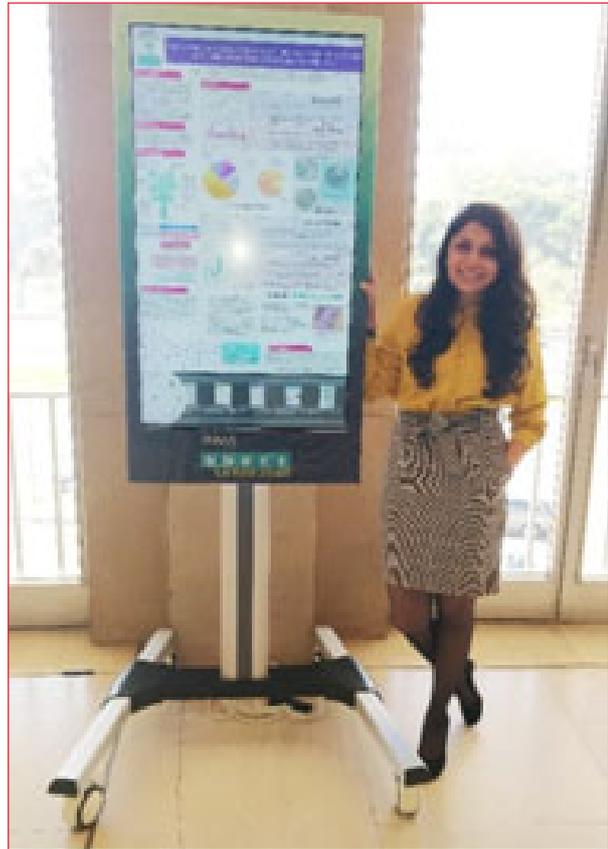


»»» **Nupur Chauhan**  
4th year MBBS, KMC Manipal

Guided by **Dr Shrikala Baliga**, Professor,  
Department of Microbiology, KMC Mangalore

Title: Infection Risk from Prescription Eyeglasses  
of Health Care Workers during Surgery and its  
Disinfection Efficacy- A Randomized Controlled  
Trial

Poster Presentation at 10th Annual International  
Medical Students Meeting, held at Lisbon,  
Portugal, Europe from 14th – 17th March, 2019



»»» **Akhila D**  
Post Graduate, Department of  
Community Medicine, KMC Manipal

Guided by **Dr Sharath Madhyastha P**, Assistant  
Professor, Department of Medicine, KMC Manipal

Title: Pneumonia in Diabetics compared with non-  
diabetics: A hospital based study

Poster Presentation at 9th World Congress  
Diabetes, held at Jaipur, India from 28th February -  
03rd March, 2019.

# Section III

Novus...Whats New in ID



## Diagnostics are essential for universal health coverage to succeed



**Madhukar Pai<sup>1</sup>, Catharina Boehme<sup>2</sup>, Ilona Kickbusch<sup>3</sup>**

*<sup>1</sup>Canada research chair in epidemiology and global health at McGill University in Montreal, the director of McGill's Global Health Programs, and director of the McGill International TB Centre.*

*<sup>2</sup>Chief executive officer of the Foundation for Innovative New Diagnostics (FINN), a global non-profit organization based in Geneva.*

*<sup>3</sup>Director of the Global Health Centre at the Graduate Institute of International and Development Studies in Geneva, and co-chair of the UHC2030 Steering Committee.*

Forty years ago, 134 countries pledged to assure "Health For All" by the year 2000. They failed to deliver on that pledge. Today, at least 400 million people have no access to basic medical care, and 40% of the world's population lacks social security protection.

Health is a human right. Humanity's failure to provide universal health coverage (UHC) is a violation of this right and must be addressed as a top priority. But it won't truly happen unless the ability to detect illnesses and outbreaks is made an integral part of it.

Thankfully, universal health coverage has re-emerged as a top priority for the World Health Organization, and is an essential element of the Sustainable Development Goals that were endorsed by all countries in 2015. Sustainable Development Goal 3.8 sets the following target for the year 2030: "Achieve universal health coverage, including financial risk protection, access to quality essential health care services and access to safe, effective, quality, and affordable medicines and vaccines for all."

As countries make progress toward universal health coverage and design and deliver their essential health benefits packages, diagnostics must be included as a key component of such packages. Why? Because most diseases or conditions cannot be correctly managed without a clear diagnosis. High-quality health care begins with seeking care, followed by a diagnosis that leads to appropriate therapy. Individual disease and outbreaks can't be stopped if the cause is not identified early.

Yet hardly any universal health coverage report or statement explicitly acknowledges the need for including essential diagnostics within the framework of universal health coverage. That stands in sharp contrast to the explicit inclusion of access to essential medicines and vaccines in most universal health coverage statements and declarations.

Even the WHO did not emphasize the value of diagnostics until recently. While it released the first Essential Medicines List in 1977, it wasn't until 2018 that it released its first Essential Diagnostics List. The first edition of the list included 113 tests, such as blood glucose and a rapid test for malaria. The second edition is expected to be released this month during the 72nd World Health Assembly. On the sidelines of the assembly, a special event will address the issue of diagnostics within the universal health coverage agenda.

When diagnostics are not acknowledged as an essential component of the health care system, they get little attention, budget, and support for implementation. If tests are not explicitly listed in national health plans or benefits packages, there is no mechanism for procurement, supply, and reimbursement.

The consequences of under investment in diagnostics and laboratories are clear. The laboratory infrastructure in most low- and middle-income countries is very weak. Even basic tests are missing in many health facilities. In a study of 10 countries, only 2% of health care facilities had the ability to perform eight basic tests — for blood glucose, hemoglobin, malaria, urine dipstick for protein and sugar, HIV, syphilis, and

pregnancy. Despite the importance of pathology in cancer care, countries in sub-Saharan Africa have at best one-tenth the pathology coverage of high-income countries.

In the absence of laboratory support, health care providers have no choice but to resort to empirical and syndromic treatment. In several countries, "mystery patient" studies that used trained actors to simulate various diseases have shown that primary care providers make correct diagnoses in less than one-third of patients who present with typical symptoms of angina, tuberculosis, asthma, diarrhea, and pneumonia. Such studies have also shown high use of broad-spectrum antibiotics. It is no surprise that antimicrobial resistance has emerged as a huge global health problem.

Even when diagnostic tests are available, health systems are often unable to effectively leverage them. Studies on cascade of care models clearly demonstrate that diagnosis is the biggest gap in the continuum of care. Take tuberculosis, the most important infectious cause of death around the world. In 30 countries with high burdens of this communicable disease, on average only 65% of cases were properly diagnosed. Or take diabetes, a common non-communicable disease. In 28 low- and middle-income countries, only 63% of those with diabetes had ever been tested with a blood glucose measurement.

Similar cascade-of-care analyses for HIV, hepatitis C, hypertension, and prevention of mother-to-child HIV transmission have each shown big gaps at the diagnosis stage. The consistency of diagnosis as a key gap across disease areas and settings is quite remarkable and underscores the chronic neglect of diagnostics and laboratories in most low- and middle-income countries.

To address this massive gap, countries need to invest in tiered, connected, integrated laboratory networks, procure quality diagnostics, and train laboratory professionals to assess results. We must reject the mindset that simple, rapid tests and syndromic treatments are "enough for poor countries." All patients, rich or poor, deserve to know their diagnosis.

The WHO Essential Diagnostics List is an important step in the right direction, as it sends a strong signal that diagnostic tests are as essential as medicines. It provides much-needed guidance to countries on what tests to prioritize and has already inspired some countries to develop their own national lists of essential tests. We hope more countries will do so and leverage the Essential Diagnostics List to plug the access gap in diagnosis.

We also need to work harder to develop novel diagnostics to address the biggest unmet needs. This includes tests for fever, antimicrobial resistance, so-called neglected tropical diseases, and others, as well as digital health solutions to address the massive epidemic of non-communicable diseases. Research and development investments are vital and need to be commensurate to the scale of need. Currently, R&D spending on diagnostics is a tiny fraction of the investments in drugs and vaccines.

Later this year, the United Nations General Assembly will host a meeting on universal health coverage. It will bring together heads of state, political and health leaders, policymakers, and champions of universal health coverage to advocate for health for all. We call on these stakeholders to include diagnostic tests as a key component of the UHC agenda and prioritize diagnostics in the global response to antimicrobial resistance and pandemics.

It is time to acknowledge that diagnostics are as important as medicines and vaccines in delivering UHC. How can we cure illnesses we cannot detect?



**Madhukar Pai**

*Canada research chair in epidemiology and global health at McGill University in Montreal, the director of McGill's Global Health Programs, and director of the McGill International TB Centre.*

### **A deadly, airborne contagion**

Imagine a contagion that silently spreads through the air, and capable of killing a quarter of a million people each year—almost one every two minutes. And yet, only a quarter of those infected get diagnosed and put on treatment. Even among the lucky people who get treated, only half get cured. Treatment is very expensive and requires prolonged treatment with highly toxic drugs. This scary scenario is not from a Sci-Fi or horror movie. It is a clear and present threat called drug-resistant tuberculosis (DR-TB).

During the Ebola outbreak in West Africa, nearly 29,000 cases of Ebola were reported during 2014 and 2016, and just over 11,000 deaths occurred due to Ebola. Compare that with the burden of drug-resistant TB. In just one year (2017), there were about twenty times as many cases and deaths globally from drug-resistant TB (558,000 cases and 230,000 deaths). There is a good reason why drug-resistant TB is called 'Ebola With Wings.'

### **Threat of antimicrobial resistance**

Drug-resistant TB is classic example of the dangers posed by antimicrobial resistance (AMR), the emergence of microbes that are resistant to antibiotics (also called 'superbugs'). Last week, the UN Interagency Coordination Group (IACG) on Antimicrobial Resistance released a report which declared that "antimicrobial resistance is a global crisis that threatens a century of progress in health and achievement of the Sustainable Development Goals (SDG)." The report states that drug-resistant infections already cause at least 700,000 deaths globally a year, including 230,000 deaths from drug-resistant TB. Total number of deaths from AMR could increase to 10 million deaths globally per year by 2050, if no action is taken.

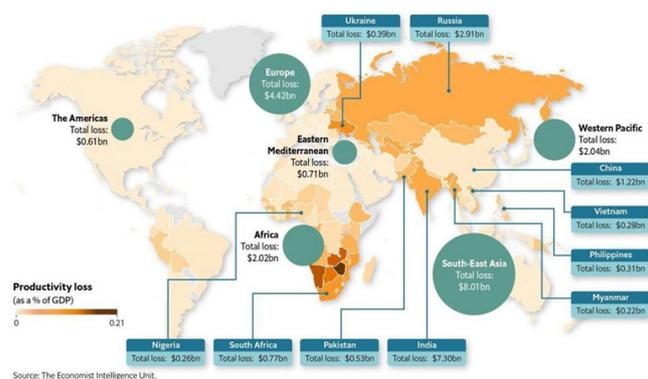
### **New report by The Economist**

Today, The Economist Intelligence Unit (EIU) published a report entitled "Its Time to End Drug-Resistant Tuberculosis." I was one of the experts who contributed to this EIU analysis. The report makes 3 key observations.

DR-TB poses a significant threat to global health security, yet gets little funding. DR-TB is estimated to cause a third of deaths due to AMR worldwide, resulting in about 230,000 deaths in 2017. And yet, financing for TB continues to woefully inadequate. In low- and middle-income countries (LMICs), which account for majority of TB cases, there was an estimated US\$3.5 billion shortfall in the US\$10.4 billion total budget required to effectively address TB in 2018. In fact, TB receives much less international donor funding than HIV and malaria, despite having a similar detrimental impact on years of healthy life lost. Because of this under-investment, TB care in 2019 is still reliant on antiquated tools that date back to the 1880s.

## DR-TB imposes a huge economic burden, on families and countries.

The EIU analysis shows that the deaths attributed to DR-TB in one year will cost the global economy at least US\$17.8 billion in future gross domestic product (GDP) at purchasing power parity (PPP). India alone accounts for 41% of losses globally, at US\$7.3 billion in PPP terms. Other countries with the largest absolute future GDP losses due to early mortality from DR-TB include China, Russia, and South Africa (graphic below).



## The case for investing in DR-TB is compelling and strong.

The EIU report makes a compelling case for countries to invest in ending TB. Investing in TB elimination makes economic sense and is among the top 20 best value-for-money SDG targets, with a return of investment of \$43 of social and economic benefit for every dollar spent. In addition to saving countless lives has the potential to advance multiple agendas from Universal Health Coverage (UHC) to AMR. Since TB is a marker of poverty, any country that addresses TB is well set to achieve UHC. Since DR-TB deaths account for a third of all AMR-related deaths, any country that addresses DR-TB is well set to address the threat of AMR.

## There is growing global commitment to fight DR-TB—but it is time for action.

Last year, for the first time ever, the United Nations hosted a High-Level Meeting on TB. After the meeting, an ambitious declaration with targets was endorsed by all countries.

But declarations are not enough. Bold, ambitious action is needed to adequately fund TB control, support the delivery of comprehensive approaches, and support research and development (R&D) efforts to develop new vaccines, diagnostics, and drugs for DR-TB. With investment and effort, we can “science the shit out of TB.”

## The Lancet Commission on TB

In March this year, The Lancet Commission on TB was published, and I had the privilege to serve as a Commissioner. The Commission argues that: “ending tuberculosis is feasible by rapidly strengthening and expanding our health delivery systems to effectively implement proven interventions we know work; accelerating innovative science to develop and implement new and improved approaches to diagnose, treat, and prevent drug-sensitive and drug-resistant tuberculosis; and substantially increasing the political will to catalyse sustainable financing for tuberculosis.”

## Accountability and advocacy

Recent, high-level political commitments by leaders of countries such as South Africa and India are inspiring and provide hope. The Indian Prime Minister has pledged to end TB in India by 2025, while South Africa has proven to be a front runner in the adoption of new diagnostics and drugs. Hopefully, other high TB burden countries will emulate South Africa and India and step up to end their TB epidemics and invest more domestic resources.

But country leaders must be held accountable for meeting their SDG targets, and here, public engagement and advocacy is critical. The HIV field has greatly benefited from patient advocacy and a human-rights approach that is centered on helping people, not just disease control. It is time for the TB community to harness the power of patient advocacy and adopt a human rights-based approach for ending TB.

## Kyasanur Forest Disease



Seshasai Kameswara Kiran<sup>1</sup>, Shipra Rai<sup>2</sup>, Kavitha Saravu<sup>3,4</sup>

<sup>1</sup>PhD Student, Department of Medicine, Kasturba Medical College, Manipal Academy of Higher Education, Manipal, Karnataka, India

<sup>2</sup>Assistant Professor, Department of Medicine, Kasturba Medical College, Manipal Academy of Higher Education, Manipal, Karnataka, India

<sup>3</sup>Professor & Unit Chief, Department of Medicine, Kasturba Medical College, Manipal Academy of Higher Education, Manipal, Karnataka, India

<sup>4</sup>Joint Coordinator, Manipal Centre for Infectious Diseases (MAC ID), Prasanna School of Public Health, Manipal Academy of Higher Education, Manipal, Karnataka, India

Kyasanur Forest disease (KFD) is caused by Kyasanur Forest disease virus (KFDV), a member of the virus family *Flaviviridae*. KFDV was identified in 1957 when it was isolated from a sick monkey from the Kyasanur Forest in Karnataka (formerly Mysore) State, India. Since then human cases have been reported. (1-3) KFD derives its name from the forest range where the virus was first isolated. It is also known as "monkey disease/monkey fever" because of its association with monkey deaths. KFDV is transmitted by the bite of hard tick, *Hemaphysalis spinigera*. These ticks are the reservoir of KFDV and have both transstadial and transovarial transmission. Rodents, shrews, and monkeys (*Macaca radiata* and *Semnopithecus entellus*) are common hosts of KFDV and this leads to epizootics with high fatality in primates. When the KFDV infected monkeys die, the ticks drop off from their host body and generate hot spots. Humans are accidental and dead-end hosts of KFDV. Humans contract KFDV through tick bite or handling of tick infested live stock or while handling monkey carcass. No human to human transmission of KFD has been reported. However, there were reports of laboratory acquired KFD during the initial days of virus discovery. The epidemic period usually begins in October or November and peaks from January to April, then declines by May and June. The epidemic/ outbreaks relate to the activity of nymphs (developing form of the tick), which is very high during November to May. (1-3)

## Kyasanur Forest Disease (KFD) Virus Ecology

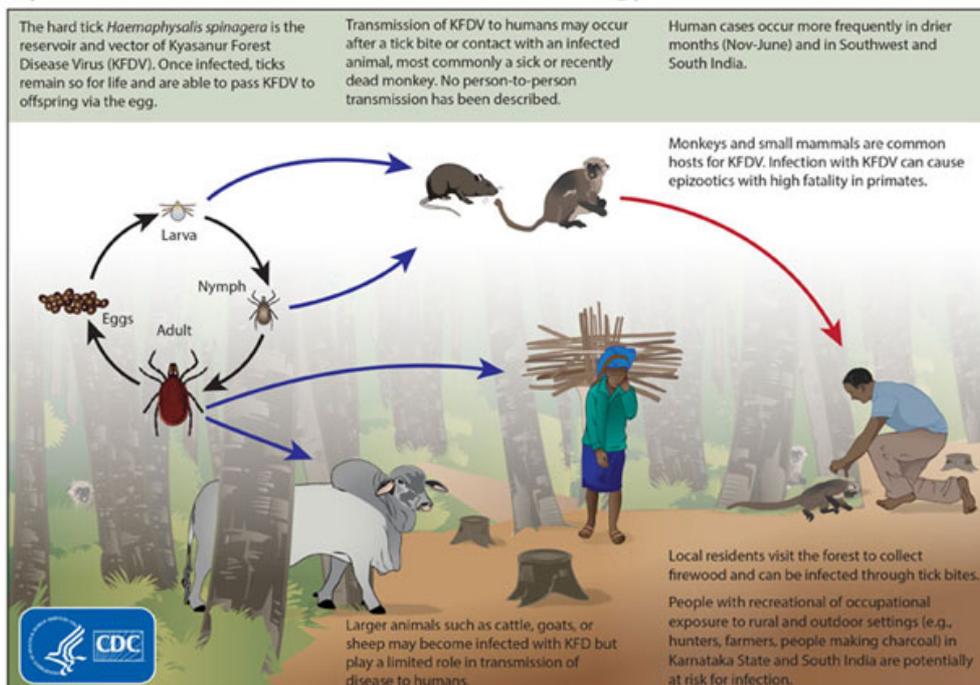


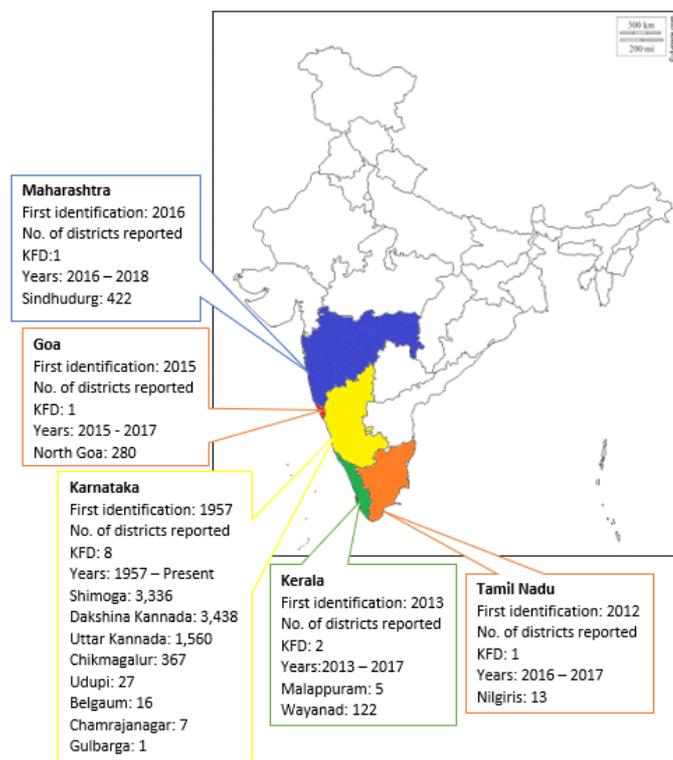
Fig.1. Transmission cycle of KFD. (Image source: <https://www.cdc.gov/vhf/kyasanur/resources/virus-ecology.html>)

The incubation period of the virus is 3-8 days. Other than febrile symptoms, it can show symptoms of local or generalized lymphadenopathy, conjunctivitis, petechial haemorrhages on mucous membrane and bleeding from nose, gums and intestines. Most patients recover within 14 days or the fever can be biphasic and can have neurologic manifestations like severe headache, mental disturbance, tremors, rigidity, photophobia, eye pain and defective vision.(3)

The diagnosis of KFDV for decades was mainly based on inoculating the patient serum into Swiss albino mice along with hemagglutination inhibition, complement fixation and neutralization. In 2012, National Institute of Virology (NIV) has developed antigen and antibody based diagnostic tools such as reverse transcriptase PCR (RT-PCR), real time reverse transcriptase PCR (real time RT-PCR) and IgM ELISA. The antigen can be detected by molecular assays in patient sample up to 10 days after the onset of illness. The real time RT-PCR could detect as low as 38 copies of RNA. The IgM ELISA is not preferred due to the cross reactivity of other flavivirus antibodies. These newly developed diagnostic tools aid in early and rapid detection of KFD than its predecessors.(4)

There is no specific treatment for KFD, but early hospitalization and supportive therapy is important. Supportive therapy includes the maintenance of hydration and the usual precautions for patients with bleeding disorders. In endemic regions, two doses of formalin inactivated tissue culture vaccine are being administered to the population during the months of August to November. However, the immunity is short lived and requires annual booster doses for a minimum of five years.(3)

KFD is emerging by further spreading its wings. Initially the cases were confined to Shimoga district of Karnataka. In recent times, multiple cases and outbreaks of KFD are being reported from different parts of Western Ghats namely, Maharashtra, Goa, Karnataka, Kerala and from Tamil Nadu.(2,5)



**Fig.2.** District wise human KFD cases reported from different states of India since 1957. (2,5)

**Table.1.** Kyasanur Forest Disease variants

S.No.	Variant	Region	Year of isolation	Genetic variance	Reference
1.	Nanjinayin	Yunnan province, China	1989	1%	(6)
2.	Alkhurma	Makkah, Saudi Arabia	1995	~8 – 9 %	(7)

## Case definition for KFD

**Presumptive case:** A patient of any age presenting with acute onset of high-grade fever with any of the following: Headache/ Myalgia/ Prostration/ Extreme weakness/ Nausea/ Vomiting/ Diarrhoea/ occasionally neurological/ haemorrhagic manifestations and history of exposure to tick bite / travel in the last 30 days and or living in and around forest area where laboratory confirmed KFD cases have been reported previously or an area where recent monkey deaths have been reported

**Confirmed case:** A presumptive case, which is laboratory- confirmed by any one of the following assays:

- Detection of KFDV-specific viral RNA by reverse transcription polymerase chain reaction (RT-PCR) or real time RT-PCR from blood or tissues.
- Isolation of KFDV in cell culture or in a mouse model, from blood or tissues.
- Positive for immunoglobulin M (IgM) enzyme-linked immunosorbent assay (ELISA) for KFD.

# As per State Government of Karnataka policy, area in a radius of 5 km from where recent monkey deaths have been reported, is considered as potential exposure zone.

**Probable case:** A presumptive case, who died before complete diagnostic specimen could be collected.

### Preventive Measures:

- Report monkey deaths to Animal husbandry/forest officials and /or Health department or Health Authority.
- Persons, who are visiting/working in the forest, should cover body with full clothes.
- Apply tick repellents like DMP oil to the exposed parts before going to forest.
- Wash the clothes and body with hot water and soap after returning from the forest.
- Report of incidence of the disease/deaths, which occurs as high fever with severe head ache and body ache to nearest health facility.
- Educate the villagers to avoid the forests areas where monkeys have died.
- Bring to the notice of the Health Department or Department Hospitals or Private Hospitals, regarding any serious cases in the villages or from KFD affected areas, which require immediate symptomatic treatment.
- Ectoparasite (tick) control in cattle and domestic animals will help in reducing the density of tick's population.
- Don't bring the leaves of trees from KFD infected area to the village for cattle bedding material. Don't visit the area where recent monkey death is been reported, especially an area where case of KFD has been reported in the past.
- Don't handle the infected monkey carcass by bare hand without personal protective equipment.(3)

### References:

1. Kyasanur Forest Disease (KFD) | CDC [Internet]. 2019 [cited 2019 Jun 14]. Available from: <https://www.cdc.gov/vhf/kyasanur/index.html>
2. MCVR\_AFI Brochure final.pdf [Internet]. [cited 2019 Jun 11]. Available from: [https://apply.manipal.edu/content/dam/manipal/mu/dovr/Documents/AFI/MCVR\\_AFI%20Brochure%20final.pdf](https://apply.manipal.edu/content/dam/manipal/mu/dovr/Documents/AFI/MCVR_AFI%20Brochure%20final.pdf)
3. 60398414361527247979.pdf [Internet]. [cited 2019 Jun 11]. Available from: <https://idsp.nic.in/WriteReadData/l892s/60398414361527247979.pdf>
4. Mourya DT, Yadav PD, Mehla R, Barde PV, Yergolkar PN, Kumar SRP, et al. Diagnosis of Kyasanur forest disease by nested RT-PCR, real-time RT-PCR and IgM capture ELISA. *J Virol Methods*. 2012 Dec 1;186(1):49–54.
5. Chakraborty S, Andrade F, Ghosh S, Uelmen J, O. Ruiz M. Historical Expansion of Kyasanur Forest Disease in India From 1957 to 2017: A Retrospective Analysis. Vol. 3. 2019.
6. Jinglin Wang, Hailin Zhang, Shihong Fu, Huanyu Wang, Daxin Ni, Roger S. Nasci, et al. Isolation of Kyasanur Forest Disease Virus from Febrile Patient, Yunnan, China. *Emerg Infect Dis J*. 2009;15(2):326.
7. Alkhurma Hemorrhagic Fever (AHF) | CDC [Internet]. 2019 [cited 2019 Jun 11]. Available from: <https://www.cdc.gov/vhf/alkhurma/index.html>

## Candida auris – The Indian Scenario



**Apoorva Jnana<sup>1</sup>, Anjali Warriar<sup>2</sup>,  
Murali TS<sup>3</sup>, Suchitra Shenoy M<sup>4</sup>**

<sup>1</sup>PhD Student, Department of Biotechnology,  
Manipal School of Life Sciences, MAHE, Manipal

<sup>2</sup>PhD Student, Department of Biotechnology,  
Manipal School of Life Sciences, MAHE, Manipal

<sup>3</sup>Associate Professor, Department of Biotechnology,  
Manipal School of Life Sciences, MAHE, Manipal

<sup>4</sup>Associate Professor Department of Microbiology,  
KMC Mangaluru, MAHE



"Challenge of deadly, Drug Resistant Fungi" This read on the editorial opinion in The Economic times on April 8th 2019 was referring to the *Candida auris* organism. *Candida auris* is a pathogenic fungus which causes severe infections in hospitalised patients including invasive candidiasis. It is often associated with high mortality rates in immune-suppressed or immunocompromised patients already affected with other diseases such as cardiovascular diseases or diabetes (Chowdhary et al., 2014). It is often wrongly diagnosed as *C. haemulonii*, *C. duobushaemulonii*, *Rhodotorula* and several other unspecified *Candida* species. Unlike other *Candida* species, *C. auris* uniquely displays high levels of resistance to multiple classes of antifungals including fluconazole, amphotericin B and echinocandins (Spivak and Hansen, 2018). The major mechanisms of resistance include enhanced production of drug transporters (Chowdhary et al., 2017). As antifungal clinical breakpoints or epidemiological cut off values have not been defined there has been a recommendation to start empiric treatment with echinocandins until the susceptibility results are available. It should be noted that being a heavy molecule echinocandins have limited penetration in tissues like central nervous system and renal tract. In such cases combination therapy with amphotericin B and 5-flucytosine has been suggested<sup>3</sup>. The uniform opinion is to avoid fluconazole, as treatment failure has been reported in United States among fluconazole-sensitive strains<sup>2,3</sup>.

Rapid and widespread emergence of *C. auris* across the globe poses a major threat to public health worldwide (Pappas et al., 2018). This species derives its name 'auris' (meaning ear) since it was first described from Japanese and Korean patients with chronic otitis media (Kwon et al., 2019). However, the earliest strain can be dated back to 1996 (from South Korea) though it was first identified in Japan in 2009; since then the species has been reported from different parts of the world including India, Pakistan, Kenya, Brazil, Columbia, Venezuela, Spain, Germany, UK and USA (Chowdhary et al., 2017).

### Indian scenario

*C. auris* isolates from across the globe exhibit high heterogeneity with distinct variabilities in sequence and protein identity. Sequence information from *C. auris* isolates obtained from different parts of the world showed that the isolates could be grouped into distinct clusters based on geography while remaining highly clonal within each cluster (Prakash et al., 2016). Reports suggest that Indian strains are genotypically distinct from Japanese and Korean strains in their ability to assimilate N-acetylglucosamine.

The first report of *C. auris* in India was from fungemia patients admitted in tertiary care and paediatric centres located in Delhi, India (Chowdhary et al., 2013). Since then several reports have emerged from across the country (Chakrabarti et al., 2015; Kathuria et al., 2015; Rudramurthy et al., 2017). Majority of the cases have been reported from North India (exception being Kochi, Kerala). In a prospective multicentre study of ICU-acquired Candidemia across India, Rudramurthy et al. (2017) have identified population susceptible to *C. auris* infection as patients with previous exposure to antifungals and sepsis patients with invasive management therapies. Kathuria et al. (2015) found 88.2% of the 102 clinical strains identified as *C. haemulonii*/*C. femata* using advanced molecular detection methods to be *C. auris*. This data calls for an imminent need to have better diagnostic tests for *Candida* species identification to be developed and integrated in Indian clinical settings. Khillan et al. (2014) highlighted a case of a patient from Delhi suffering from fungal pericardial effusion caused by *C. auris* who experienced a fatal outcome despite being on antifungal therapy as suggested by standard resistance detection methods. This case questions the relevance of MIC values in the case of non-albicans *Candida* species such as *C. auris* for which, the susceptibility/resistance breakpoints are not defined yet (Jeffery-Smith et al., 2017) and are based on those established for closely related *Candida* species (Vatanshenassan et al., 2019).

The huge outbreak potential of *C. auris* in a middle income country such as India, largely due to overcrowding of hospitals and cost constraints and the inability to correctly identify the pathogen due to lack of cost-effective and easily accessible advanced molecular techniques makes *C. auris* the ideal pathogen for intensive study. In addition, there is also a need to establish susceptibility/resistance breakpoints specific to *C. auris* cases worldwide.

## References:

1. Chakrabarti A, Sood P, Rudramurthy SM, Chen S, Kaur H, Capoor M, Chhina D, Rao R, Eshwara VK, Xess I, Kindo AJ, Umabala P, Savio J, Patel A, Ray U, Mohan S, Iyer R, Chander J, Arora A, Sardana R, Roy I, Appalaraju B, Sharma A, Shetty A, Khanna N, Marak R, Biswas S, Das S, Harish BN, Joshi S, Mendiratta D. Incidence, characteristics and outcome of ICU-acquired candidemia in India. *Intensive Care Med*. 2015 Feb;41(2):285-95.
2. Chowdhary A, Anil Kumar V, Sharma C, Prakash A, Agarwal K, Babu R, Dinesh KR, Karim S, Singh SK, Hagen F, Meis JF. Multidrug-resistant endemic clonal strain of *Candida auris* in India. *Eur J Clin Microbiol Infect Dis*. 2014 Jun;33(6):919-26.
3. Chowdhary A, Sharma C, Duggal S, Agarwal K, Prakash A, Singh PK, Jain S, Kathuria S, Randhawa HS, Hagen F, Meis JF. New clonal strain of *Candida auris*, Delhi, India. *Emerg Infect Dis*. 2013 Oct;19(10):1670-3.
4. Chowdhary A, Sharma C, Meis JF. *Candida auris*: A rapidly emerging cause of hospital-acquired multidrug-resistant fungal infections globally. *PLoS Pathog*. 2017 May 18;13(5):e1006290.
5. Jeffery-Smith A, Taori SK, Schelenz S, Jeffery K, Johnson EM, Borman A; *Candida auris* Incident Management Team, Manuel R, Brown CS. *Candida auris*: a Review of the Literature. *Clin Microbiol Rev*. 2017 Nov 15;31(1).
6. Kathuria S, Singh PK, Sharma C, Prakash A, Masih A, Kumar A, Meis JF, Chowdhary A. Multidrug-Resistant *Candida auris* Misidentified as *Candida haemulonii*: Characterization by Matrix-Assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry and DNA Sequencing and Its Antifungal Susceptibility Profile Variability by Vitek 2, CLSI Broth Microdilution, and Etest Method. *J Clin Microbiol*. 2015 Jun;53(6):1823-30.
7. Khillan V, Rathore N, Kathuria S, et al. A rare case of breakthrough fungal pericarditis due to fluconazole resistant *Candida auris* in a patient with chronic liver disease. *JMM Case Reports*. 2014 1:1-5
8. Kwon YJ, Shin JH, Byun SA, Choi MJ, Won EJ, Lee D, Lee SY, Chun S, Lee JH, Choi HJ, Kee SJ, Kim SH, Shin MG. *Candida auris* Clinical Isolates from South Korea: Identification, Antifungal Susceptibility, and Genotyping. *J Clin Microbiol*. 2019 Mar 28;57(4).
9. Pappas PG, Lionakis MS, Arendrup MC, Ostrosky-Zeichner L, Kullberg BJ. Invasive candidiasis. *Nat Rev Dis Primers*. 2018 May 11;4:18026.
10. Prakash A, Sharma C, Singh A, Kumar Singh P, Kumar A, Hagen F, Govender NP, Colombo AL, Meis JF, Chowdhary A. Evidence of genotypic diversity among *Candida auris* isolates by multilocus sequence typing, matrix-assisted laser desorption ionization time-of-flight mass spectrometry and amplified fragment length polymorphism. *Clin Microbiol Infect*. 2016 Mar;22(3):277.e1-9.
11. Rudramurthy SM, Chakrabarti A, Paul RA, Sood P, Kaur H, Capoor MR, Kindo AJ, Marak RSK, Arora A, Sardana R, Das S, Chhina D, Patel A, Xess I, Tarai B, Singh P, Ghosh A. *Candida auris* candidaemia in Indian ICUs: analysis of risk factors. *J Antimicrob Chemother*. 2017 Jun 1;72(6):1794-1801.
12. Spivak ES, Hanson KE. *Candida auris*: an Emerging Fungal Pathogen. *J Clin Microbiol*. 2018 Jan 24;56(2).
13. Vatanshenassan M, Boekhout T, Meis JF, Berman J, Chowdhary A, Ben-Ami R, Sparbier K, Kostrzewa M. *Candida auris* Identification and Rapid Antifungal Susceptibility Testing Against Echinocandins by MALDI-TOF MS. *Front Cell Infect Microbiol*. 2019 Feb 18;9:20.

## Antimicrobial Susceptibility Testing by Microscopy – An emerging option!!!



**Dr Shashidhar V**

*Associate Professor, Department of Microbiology,  
Kasturba Medical College, MAHE, Manipal*

Rapid and appropriate antimicrobial therapy is the most important single factor for the survival of patients with serious bacterial infections. Each Hour Counts!! In the presence of sepsis or septic shock, each hour delay in instituting appropriate antimicrobial correlates with measurable increase in mortality<sup>1</sup> and the delay can have negative effect on clinical cure and length of hospitalization. One of the components of antimicrobial stewardship program is to detect resistance related traits as soon as possible which allows either de-escalation or escalation of antibiotic therapy. Early & appropriate treatment improves outcomes in terms of in-hospital mortality, ICU stay, no. of lab tests, antimicrobial consumption and also reduces the risk of selection of resistant pathogens. In this context, it is necessary that rapid techniques emerge for antimicrobial susceptibility testing.

Microscopy, especially gram stain is considered as an important diagnostic tool by the clinical microbiologists and microscopy being applied for antimicrobial susceptibility testing (AST) is a welcome innovation.

Currently, laboratories worldwide provide susceptibility test results based on phenotypic assays using either disc diffusion or the broth dilution methods which in addition provide MIC values. These assays are growth based, requiring prior bacterial culture from the specimens. Phenotypic assays analyze bacterial growth in the presence of antibiotics. Automated phenotypic assays are being increasingly adopted. Vitek 2 (bioMérieux Inc.), MicroScan WalkAway plus (Beckman Coulter), Sensititre ARIS 2X (Thermo Scientific), and Phoenix System (BD Diagnostics) are the most popular ones.

Laboratories perform and interpret the susceptibility test results based on either Clinical Laboratory Standards Institute (CLSI) or European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines. In India, labs majorly follow CLSI guidelines. Both these guidelines require susceptibility being performed on isolated bacterial colonies which affects the turn-around time (TAT) and hence the definitive therapy is possible only by 48-72 hours after sample being received in the lab. Molecular AST is expensive and doesn't cover all possible resistance mechanisms and is currently restricted to few pathogens like *M. tuberculosis*.

In the recent past, research is underway to find a suitable rapid AST method. Same day AST results is likely be possible in the near future. Apart from being rapid, the results generated by the alternative techniques should be accurate. The ideal expectancy being 100% positive predictive value for Susceptible (S) and Resistant (R) results, i.e. if a susceptible report is issued for a particular antibiotic, treatment should be successful in 100% of cases. However, there are many lab independent variables which can affect this.

Automated microscopy is one among the various novel approaches for rapid, direct, culture independent antimicrobial susceptibility testing. Accelerate Pheno system (Accelerate diagnostics Inc.) is one of the many versions looking at microscopy as an option for AST. This technique aims to identify and perform AST directly from samples avoiding the need for traditional culture. The system is based on Morphokinetic Cellular Analysis where the phenotypic features like size, shape, division rate of individual bacterial cells growing into micro-colonies and light intensity of the growing clone over time are tracked in the presence of antibiotics.

The identification of bacteria in about 90 minutes is based on qualitative nucleic acid fluorescence in situ hybridization (FISH). This instrument identifies the common bacteria isolated (but not all) from positive

blood cultures including *E. coli*, *Klebsiella* spp., *Enterobacter* spp., *P. aeruginosa*, *Acinetobacter* spp., *S. marcescens*, *S. aureus*, *E. faecalis*, *E. faecium*, *CONS* spp., and some *Streptococcus* spp. The AST panel includes, cephalosporins, carbapenems, BL-BLIs, aminoglycosides, quinolones, daptomycin, vancomycin, linezolid and others. Some of the organism-antimicrobial combinations are under research use only (RUO).

The US FDA in 2017 has approved Accelerate Pheno system for identification and antibiotic susceptibility testing of pathogens directly from positive blood culture samples. Following gram stain, an aliquot of positive blood culture sample is placed in the sample vial of the 48-channel test cassette, which along with the reagent cartridge is loaded in to the instrument. Following organism identification, sample preparation, cell capture and AST is carried out in the individual flowcells of the cassette.<sup>2</sup> The cells are scanned by dark-field microscopic observation of individual, live, growing, immobilized bacterial cells every 10 minutes for about 4.5 hrs. in the presence (test) or absence (control) of antimicrobial agents. The susceptibility reports (S/I/R) and positive or negative results for phenotypic resistance markers (MRSA/MLSB) are generated along with MIC values in about 7 hours. Further details about the instrument may be obtained from <http://acceleratediagnostics.com/products/accelerate-pheno-system/>

Encouraging data has emerged for the use of Accelerate Pheno with acceptable essential agreement (EA) and categorical agreement (CA) in comparison with other methods of AST and has shown less, very major errors (VME) and major errors (ME). Also, some studies have found it useful for patient management.<sup>3-7</sup>

Cost per test, Equipment foot print for labs processing large number of samples, frequency of isolation of pathogens which are off-panel, need for antimicrobial agents not in the panel, lack of species level identification of certain bacteria, polymicrobial blood cultures, not being suitable for bottles containing charcoal, currently being approved for only positive blood cultures are few issues that needs consideration by the labs before utilizing Accelerate Pheno for routine use. More studies on its performance for each organism-antimicrobial combination, impact on clinical outcomes and potential interference with antimicrobials in the samples is needed.

There are other publications where microscopy for AST is applied directly on specimens other than positive blood cultures like urine and others. More such innovations providing accurate microbial identification, quantitation wherever needed, and AST directly from samples are essential. MALDI-TOF MS for microbial identification has been a revolution in clinical microbiology laboratories in the recent past. Similar advances are needed in the field of AST which can provide fast yet accurate results. To conclude, Automated digital microscopy and T2 Magnetic Resonance Technology (T2MR) seem to be the promising technologies for AST to watch out for in the foreseeable future.

## References:

1. Rhodes A, Evans LE, Alhazzani W, Levy MM, Antonelli M, Ferrer R et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock:2016. *Crit Care Med.* 2017 Mar;45(3):486-552.
2. Evaluation of Automatic Class III Designation for Accelerate PhenoTest BC Kit. Decision Summary. Available from: [https://www.accessdata.fda.gov/cdrh\\_docs/reviews/DEN160032.pdf](https://www.accessdata.fda.gov/cdrh_docs/reviews/DEN160032.pdf). Accessed on 5 July 2019.
3. Marschal M, Bachmaier J, Autenrieth I, Oberhettinger P, Willmann M, Peter S. Evaluation of the Accelerate Pheno System for Fast Identification and Antimicrobial Susceptibility Testing from Positive Blood Cultures in Bloodstream Infections Caused by Gram-Negative Pathogens. *J Clin Microbiol.* 2017 Jul;55(7):2116-26.
4. Charnot-Katsikas A, Tesic V, Love N, Hill B, Bethel C, Boonlayangoor S et al. Use of the Accelerate Pheno System for Identification and Antimicrobial Susceptibility Testing of Pathogens in Positive Blood Cultures and Impact on Time to Results and Workflow. *J Clin Microbiol.* 2018;56(1):e01166-17.
5. Pancholi P, Carroll KC, Buchan BW, Chan RC, Dhiman N, Ford B et al. Multicenter Evaluation of the Accelerate PhenoTest BC Kit for Rapid Identification and Phenotypic Antimicrobial Susceptibility Testing Using Morphokinetic Cellular Analysis. *J Clin Microbiol.* 2018;56(4):e01329-17.
6. Burnham JP, Wallace MA, Fuller BM, Shupe A, Burnham CD, Kollef MH. Clinical Effect of Expedited Pathogen Identification and Susceptibility Testing for Gram-Negative Bacteremia and Candidemia by Use of the Accelerate Pheno™ System. *The Journal of Applied Laboratory Medicine* 2019;3(4):569-79.
7. Humphries R, Martino TD. Effective implementation of the Accelerate Pheno™ system for positive blood cultures. *J Antimicrob Chemother* 2019;74(Suppl 1):i40-3.



**Dr Mridula. M**

*Associate Professor, Department of Microbiology,  
Kasturba Medical College, MAHE, Manipal.*

### Introduction:

Hepatitis C virus (HCV) is one of the causes of viral hepatitis and belongs to the genus Hepacivirus in the family Flaviviridae.[1] It is an enveloped virus containing a single-stranded RNA genome. The disease caused by the virus was previously known as non-A non-B hepatitis. Bloodborne transmission is the primary mode of HCV transmission. Infection is commonly acquired through infected syringes and needles, transfusion of infected blood and by sexual contact. The vertical transmission is also known. The risk of transmission of HCV from a mother to her child is 4–8% among women with HCV infection, and 10.8–25% among women with HIV and HCV co-infection.[2] The disease manifests both in acute and chronic form. Around 50–80% of acute cases progress to chronicity. Long term complications of the disease include fibrosis, cirrhosis and hepatocellular carcinoma.[3]

### Diagnosis:

National guidelines for diagnosis and management of viral hepatitis, the priority groups where HCV screening is indicated are,

- People who inject drugs (PWID)
- Men who have sex with men
- Female sex workers
- People who received blood transfusion before routine testing for hepatitis C
- People who need frequent blood transfusion, such as, thalassaemic and dialysis patients
- People living with HIV
- Inmates of prisons and other closed settings.

The diagnosis of Hepatitis C depends mainly on the detection of antibodies to Hepatitis C, viral RNA and HCV core antigen (HCVcAg).

### Antibodies to HCV:

The first step in HCV diagnostic algorithm is detection of antibodies against HCV. A negative result would indicate no infection, excepting the scenarios of recent exposure and profound immunosuppression. Also, there is a serological window of 6–8 weeks between infection and development of antibodies. [3] A positive antibody should be followed by a test for viral RNA or viral antigen to confirm ongoing infection, as the mere presence of antibody indicates only exposure to the virus. Classical test format for detection of HCV antibodies has been Enzyme Linked Immunosorbent Assay (ELISA). Three generations of ELISA are described. First generation platforms used recombinant epitopes of NS3, second generation, a combination of epitopes of NS3 and NS4. Third was more sensitive epitopes designed for NS3, NS4 and NS5 regions. [4] With each generation, the detection window has decreased; the third-generation tests claim to have reduced the window period to 8 weeks. Most of the chemiluminescent immunoassays also work as third generation ELISAs and promise a better sensitivity. However, false positivity is observed to be higher with this format.[4]

### **HCV RNA Detection:**

HCV RNA is indicated in all cases where HCV antibody is positive. Positive RNA indicates acute infection as it is detectable 4-6 weeks before seroconversion. Viral RNA detection may be qualitative or quantitative. Classical recommendations for HCV RNA testing include:

- HCV seropositive patients to confirm acute infection.
- Confirming the presence of HCV viremia in seronegative patients who are immunocompromised.
- Babies born to HCV positive mothers- as antibody testing in babies can give false positive results up to 18 months of age
- Determining the baseline value before starting the anti-viral therapy. [5]
- For confirming sustained virological response [SVR] following treatment which is defined as the continued absence of detectable HCV RNA for at least 12 weeks after completion of therapy. [6]

### **HCV core antigen (HCVcAg):**

HCV core antigen is known to follow HCV RNA dynamics and is useful in diagnosing the disease before seroconversion and for clinical monitoring. The test uses EIA or CLIA platforms and is user-friendly.

Many studies have compared the diagnostic value of HCVcAg with HCV RNA. One meta-analysis concluded that while HCVcAg could be used as a cost-effective alternative to HCV RNA detection for diagnosis and treatment monitoring, it could be suboptimal in determining SVR. [7] The sensitivity of HCVcAg is shown to range between 94% to 100% and its specificity is 95%. [7]

### **HCV Genotyping:**

HCV is genetically diverse, with 7 genotypes and various subtypes under each genotype. Globally, genotype 1 is the most common, followed by genotype 3. [8] Many studies from India have consistently shown that genotype 3 is most common in India. [1] Genotype of the virus played a pivotal role in deciding the duration of therapy when a combination of pegylated interferon and ribavirin were used for therapy of HCV. With introduction of directly acting anti-viral drugs (DAA) which act by blocking some of the key viral proteins, importance of determining the genotype for choosing the treatment has reduced. However, viral genotype is still a major determinant of treatment response as some genotypes are proven to respond better to DAA. [9] Some of the DAAs are also genotype specific. Genotype 1 and Genotype 2 respond better to DAA therapy than genotype 3. Knowledge of prevalent genotypes is essential for the development of national treatment strategies. The most used method is the sequencing of highly conserved regions such as NS5, core, E1 and 5'UTR. Other methods include polymerase chain reactions, line probe assays and ELISAs to detect antibodies against a genotype. [8]

### **Conclusion:**

Currently, demonstration of antibodies against HCV is the first step in diagnosis followed by detection of viral RNA. Molecular techniques both in the form of RNA quantification and genotype detection are very crucial for the treatment of HCV infection.

## Diagnostic algorithm for HCV testing. [10]

HCV ANTIBODY		
POSITIVE	NEGATIVE	
HCV RNA – Positive – current HCV infection - further workup for treatment.	HCV RNA – Negative – No current infection *Testing HCV antibody with another assay to rule out biological false positive. *Repeat testing of HCV RNA if there is history of suspected exposure in last 6 months.	No infection in absence of suspected exposure in last six months or immunosuppression. *In case of suspected exposure : HCV RNA / follow up with HCV antibody. *In case of immunosuppression : HCV RNA testing.

### References:

1. Christdas J, Sivakumar J, David J, Daniel HD, Raghuraman S, Abraham P. Genotypes of hepatitis C virus in the Indian sub-continent: a decade-long experience from a tertiary care hospital in South India. *Indian J Med Microbiol.* 2013 Oct-Dec;31(4):349-53.
2. Government of India, Ministry of Health and Family welfare. National guidelines for diagnosis and management of viral hepatitis. 2018. 80p.
3. Manns, M.P., Buti, M., Gane, E., Pawlotsky, J.-M., Razavi, H., Terrault, N. et al. Hepatitis C virus infection. *Nat Rev Dis Prim.* 2017; 3: 17006
4. Gupta E, Bajpai M, Choudhary A. Hepatitis C virus: Screening, diagnosis, and interpretation of laboratory assays. *Asian J Transfus Sci.* 2014; 8:19–25.
5. Firdaus R, Saha K, Biswas A, Sadhukhan PC. Current molecular methods for the detection of hepatitis C virus in high risk group population: A systematic review. *World J Virol.* 2015; 4:25–32.
6. AASLD, IDSA. Testing, Evaluation, and Monitoring of Hepatitis C [ Internet ]. 21 September 2017 [ cited on 8July 2019]. Available from <https://www.hcvguidelines.org/evaluate/monitoring>.
7. Van Tilborg M, Al Marzooqi SH, Wong WWL, et al. HCV core antigen as an alternative to HCV RNA testing in the era of direct-acting antivirals: retrospective screening and diagnostic cohort studies. *Lancet Gastroenterol Hepatol.* 2018; 3:856-64.
8. Kumar A, Rajput MK, Paliwal D et al. Genotyping & diagnostic methods for hepatitis C virus: A need of low-resource countries. *Indian J Med Res.* 2018;147(5):445–455.
9. Cavalcante LN, Lyra AC. Predictive factors associated with hepatitis C antiviral therapy response. *World J Hepatol* 2015; 7:1617-1631.

## Actinomyces and its Diagnostic Challenges



Dr. Padmaja A Shenoy<sup>1</sup>, Dr. Kiran Chawla<sup>2</sup>

<sup>1</sup>Associate Professor, Department of Microbiology,  
Kasturba Medical College, MAHE, Manipal

<sup>2</sup>Professor & Head, Department of Microbiology,  
Kasturba Medical College, MAHE, Manipal

Actinomyces is an indolent slowly progressing chronic granulomatous bacterial disease caused by heterogeneous group of Gram-positive, non-sporing, non-acid fast and facultative anaerobic, diphtheroidal or delicately branching filamentous bacteria belonging to *Actinomyces* genera. This disease was once initially thought to be caused by *Streptothrix israelii* (currently *Actinomyces israelii*), as described in 1896 by Kruse, until other species of *Actinomyces* came into light. [1-3] *Actinomyces* species are frequently found as members of the normal microflora, especially in the mouth and they reside on mucosal surfaces and gain access to deeper tissues via trauma, surgical procedures or foreign bodies, which disrupt the mucosal barrier, resulting in different disease presentations. So far more than 40 species of *Actinomyces* have been described among which 25 are found in the human microbiota. [4] Amongst different species, *Actinomyces israelii* is the most prevalent key species responsible for classical actinomyces [1,3]

The typical actinomyces is characterized by the formation of granulomatous tissue, necrosis and major reactive fibrosis, draining sinuses, abscesses, and the development of fistulas. [4] The disease per se can be classified based on affected body site as orocervicofacial, thoracic and abdominopelvic forms. Apart from these, it can also manifest as cutaneous actinomyces, musculoskeletal form, pericarditis, infection of the central nervous system (CNS), or disseminated variety. Orocervicofacial actinomyces is the most common form of actinomyces accounting for more than half of all classical actinomyces cases followed by abdominal actinomyces (20%) and thoracic actinomyces (15-20%). [4] Dental plaque, caries tooth and poor oral hygiene could be the common predisposing conditions associated with orocervicofacial actinomyces. *A. israelii*, *A. naeslundii*, *A. viscosus*, *A. odontolyticus* and *A. neuii subsp. neuii* are the commonly encountered *Actinomyces* species in this clinical variety. Thoracic actinomyces could be caused due to aspiration of oropharyngeal secretions, spread by haematogenous route or directly spread from local lesions resulting in actinomycotic lesions in pulmonary sites. *A. graevenitzi* appears to have a great predilection for respiratory sites. [1-3] Abdominal actinomyces can occur as consequence of invasive techniques or abdominal infection such as appendicitis. Whereas, cases of pelvic actinomyces are usually associated with prolonged usage of intrauterine contraceptive devices (IUCD). *A. israelii*, *A. turicensis*, *A. naeslundii*, *A. odontolyticus*, and *A. gerencseriae* are the common actinomycotic isolates in abdominopelvic actinomyces. [1-4]

The non-specific presentation such as swelling, cough, low grade fever and weight loss leads to delay in seeking medical attention, thus making early diagnosis of the disease difficult in cases of actinomyces. The microbiological diagnosis of actinomyces is difficult because of initiation of antimicrobial therapy before specimen collection and polymicrobial nature of the infection (where other organisms inhibit the growth of *Actinomyces* spp.). In addition to this, any delay in collection and early transport of appropriate clinical specimens and lack of prolonged incubation of selective culture media (with regard to strict anaerobic characteristics of majority of *Actinomyces* species) in strict anaerobic atmospheres to attain optimal growth may result in high culture negativity rates. [6] The most suitable specimens would be a tissue biopsy from infected sites or pus aspirates. Macroscopic findings of the specimen may reveal presence of sulphur granules in pus or tissue specimens, however, presence of Sulphur granules alone is not unique to

actinomycosis as it is also seen in cases of *Nocardia brasiliensis* infections, *Streptomyces madurae* infections, chromomycosis and botryomycosis. [5, 7,8]

Whenever the Gram stain is performed from clinical specimens, one has to look for varied morphological forms such as coccoid, coccobacillary, coryneform and bacillary form rather than restricting to the usual branching filamentous forms. As many of the species produce pigmented colonies on special culture media, there is a requirement of prolonged incubation at least for about 5-10 days. [2] In most of the laboratories, the identification of the isolates is based on commercial phenotypic identification kits including VITEK®2 ANC ID Card or usage of conventional established biochemical methods which may be unreliable for accurate identification of the isolates.[2,9] As per literature survey, most of the diagnosis of Actinomycosis cases were done based on histopathological findings and very rarely microbiological opinion was pursued. [1] But with introduction of more sophisticated novel molecular methods such as 16S rRNA sequencing and improved database of matrix-assisted laser desorption ionization time-of-flight (MALDI-TOF) has made the identification of *Actinomyces* species easy, accurate, relatively rapid and reliable. [2,3,9]

Actinomycosis infections are uncommon but when they occur, they can be serious, demanding prolonged antibiotic therapy with  $\beta$ -lactam group of drugs. As the organism can infect any part of the body, a multidisciplinary approach involving infectious disease consultant, surgeons, pathologists and microbiologist would be ideal for better management of actinomycosis.

## References:

1. Könönen E, Wade WG. Actinomyces and related organisms in human infections. Clin Microbiol Rev. 2015 Apr;28(2):419-42.
2. Sarkonen N, Könönen E, Summanen P, Könönen M, Jousimies-Somer H. Phenotypic identification of Actinomyces and related species isolated from human sources. J Clin Microbiol. 2001 Nov;39(11):3955-61.
3. Valour F, Sénéchal A, Dupieux C, Karsenty J, Lustig S, Breton P, Gleizal A., et al. Actinomycosis: etiology, clinical features, diagnosis, treatment, and management. Infect Drug Resist. 2014 Jul 5;7:183-97.
4. Li J, Li Y, Zhou Y, Wang C, Wu B, Wan J. Actinomyces and Alimentary Tract Diseases: A Review of Its Biological Functions and Pathology. Biomed Res Int. 2018 Aug 26;2018:3820215.
5. Smego RA Jr, Foglia G. Actinomycosis. Clin Infect Dis. 1998 Jun; 26(6):1255-61; quiz 1262-3.
6. Sharma S, Valentino III DJ. Actinomycosis. [Updated 2019 Apr 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482151>
7. Varkey B. Sulfur Granules. JAMA. 1982;248(22):3025.
8. Boyanova L, Kolarov R, Mateva L, Markovska R, Mitov I. Actinomycosis: a frequently forgotten disease. Future Microbiol. 2015;10(4):613-28.
9. Fong P, Francis MJ, Hamblin JF, Korman TM, Graham M. Identification and diversity of Actinomyces species in a clinical microbiology laboratory in the MALDI-TOF MS era. Anaerobe. 2018 Dec;54:151-158.

**TITLE: Spontaneous bacterial peritonitis: an unusual presentation of Melioidosis.**



**Sharath Madhyastha<sup>1</sup>, Shubha Sheshadri<sup>1</sup>,  
Akhya Sharma<sup>1</sup>, Vandana K E<sup>2</sup>, Ganesh Shetty<sup>1</sup>**

<sup>1</sup>Department of Medicine

<sup>2</sup>Department of Microbiology, KMC, MAHE, Manipal.

**ABSTRACT:** Melioidosis is caused by *Burkholderia pseudomallei* and presenting as pneumonia in majority of the affected patients. The next common presentations include soft tissue involvement and multiple abscesses over skin, liver and spleen. Bone and CNS involvement have very rarely been reported, whereas there have been no reports of peritonitis due to this organism so far. We, here, report a case of spontaneous bacterial peritonitis due to Melioidosis.

**KEY WORDS:** Diabetes, Melioidosis, Peritonitis.

**CASE REPORT:** A 51-year-old woman, known case of diabetes, hypertension and decompensated liver cirrhosis with portal hypertension, presented with high grade, intermittent fever and abdominal pain for 20 days. There was no significant family or personal history. Her treatment history included Insulin, Telmisartan and Amlodipine. General examination revealed icterus and bilateral pedal edema. On abdominal examination, there was diffuse tenderness, tense ascites, and fluid thrill. The cardiovascular and respiratory systems were normal.

Routine blood investigations revealed uncontrolled sugars with a glycated hemoglobin of 13.1% (RBS- 411). Her blood counts and renal function tests were normal. Liver function test showed reversal of albumin and globulin ratio (Albumin - 2.6, Globulin - 4.8). Abdominal ultrasound was suggestive of cirrhosis with portal hypertension. Hepatic Vein Doppler was normal. She was started on empirical antibiotics (Ceftriaxone) after sending the blood sample for culture and sensitivity. Workup for all the endemic infectious diseases (Malaria, Widal, Leptospirosis, Scrub Typhus/Spotted fever, Weil Felix, and Brucella) were negative. Ascitic fluid aspiration was done and sent for culture and analysis. The ascitic fluid analysis revealed 1600 WBCs/cu.mm (73% neutrophils, 27% lymphocytes) consistent with Spontaneous Bacterial Peritonitis. Ascitic fluid culture was positive for *Burkholderia pseudomallei*. She was investigated further for the cause of cirrhosis. She never consumed alcohol. Viral markers HBsAg and anti-HCV were negative. Workup for autoimmune hepatitis, hemochromatosis and Wilson's disease were also negative. Finally, we are left with either non-alcoholic fatty liver disease (NAFLD) or cryptogenic cirrhosis. Liver biopsy was deferred in view of active infection.

The patient was treated with IV Meropenem for two weeks, following which her fever subsided and she responded well. Her fever and abdominal distension subsided rapidly and she was discharged on trimethoprim-sulfamethoxazole (TMP-SMX, co-trimoxazole) for six months and was asymptomatic at follow up.

**DISCUSSION:** *Burkholderia pseudomallei* is a gram-negative bacilli, which is widely disseminated in soil, water and paddy fields. It is geographically reported in the tropical and subtropical areas of Australia and Southeast Asian countries. In India, the number of cases were scarce before, though the numbers are on the rise. A large number of Melioidosis cases go unreported due to lack of suspicion and diagnostic workup. Most of the cases reported from India were from the southern part. [1]

The mode of infection is believed to be through inhalation, inoculation or ingestion. The single most important risk factor for Melioidosis is diabetes mellitus, followed by chronic alcohol addiction, chronic lung

disease, chronic kidney disease, Thalassemia, occupation (rice paddy farmers) and Cystic fibrosis. The presence of specific risk factors for infection, such as Diabetes mellitus, suggests that a functional neutrophil defect is important in its pathogenesis. [2]

90% of patients present with pneumonia whereas parotitis constitutes almost 40% of paediatric population presentation. CNS, bone and soft tissue involvement are rarely seen. CNS involvement is generally in the form of Brain stem disease, abscesses or meningoencephalitis. Bone involvement has been reported in only 16% cases. [3, 4] There have been few cases of isolation of *B. pseudomallei* in pleural and cerebrospinal fluid, but no case has been reported for isolation of this organism in ascitic fluid so far. One rare case report of Melioidosis presenting as pseudomyxoma peritonei in peritoneal fluid in a patient undergoing peritoneal dialysis has been reported. [5]

The gold standard for definitive diagnosis of Melioidosis still remains isolation of the organism by culture. It is a very easy bacterium to culture, but the lack of familiarity with a low index of suspicion for this organism can lead to diagnostic delay. [6]

As reported in the previous studies and cases in literature so far, the treatment of Melioidosis essentially is done in two phases: Intensive and Eradication phases. Intensive phase generally includes treatment with Ceftazidime – 40 mg/kg/dose Q8H for two weeks OR IV Meropenem 25 mg/kg Q8H, if patient is critically ill with many systemic manifestations or involvement. Four to eight weeks or longer of intensive therapy should be administered to patients who are critically ill, deep seated collection, osteomyelitis or septic arthritis. Eradication phase is generally started on discharge and comprises TMP-SMX 320/1600g Q12H for 12-20 weeks with or without Doxycycline 4mg/kg/day. In some centers TMP-SMX is started right from the beginning along with Ceftazidime or Meropenem in critically ill patients. [7,8]

Our patient had poorly controlled diabetes as a significant risk factor and presented with fever along with other systemic manifestations. The diagnosis was confirmed by culture and was treated with the standard protocol of intensive therapy using Meropenem during hospital stay and was discharged on continuation therapy with oral cotrimoxazole for a period of 6 months. She responded very well to the antibiotics, improved significantly and was asymptomatic on follow-up.

**CONCLUSION:** A high index of suspicion of Melioidosis should be considered when patient has risk factors such as diabetes and doesn't respond to empirical treatment, as fever is the main presentation in Melioidosis. Workup and treatment for Melioidosis should be started as early as possible as this significantly reduces the mortality rate. Spontaneous Bacterial Peritonitis due to *Burkholderia pseudomallei* is almost unheard and to the best of our knowledge this will be the maiden case in literature so far.

## References:

1. Vidyalakshmi K, Shrikala B, Bharathi B, Suchitra U. Melioidosis: An under-diagnosed entity in Western coastal India: A clinico-microbiological analysis. Indian J Med Microbiol. 2007;25:245–8
2. Morse SS. Factors in the emergence of infectious diseases. Emerg Infect Dis. 1995;1:7–15
3. Limmathurotsakul D, Golding N, Dance DA, Messina JP, Pigott DM, Moyes CL, et al. Predicted global distribution of *Burkholderia pseudomallei* and burden of melioidosis. Nat Microbiol. 2016;1:15008.
4. Currie BJ, Fisher DA, Howard DM, Burrow JN (2000) Neurological melioidosis. Acta Trop 74: 145-151.
5. Sugi Subramaniam RV, Karthikeyan VS, Sistla SC, Ali SM, Sistla S, Ram D, Sudhagar R. Melioidosis presenting as pseudomyxoma peritonei: yet another pretense of the great mimicker: an unreported entity. Surg Infect (Larchmt). 2013 Aug;14(4):415-7.
6. CLSI. CLSI Supplement M100S. 26th ed. Vol. 26. Wayne, PA: Clinical and Laboratory Standards Institute; 2016. Performance Standards for Antimicrobial Susceptibility Testing; p. 216.
7. Dance D. Treatment and prophylaxis of melioidosis. Int J Antimicrob Agents. 2014;43:310–8.
8. Cheng AC, Fisher DA, Anstey NM, Stephens DP, Jacups SP, Currie BJ. Outcomes of patients with melioidosis treated with meropenem. Antimicrob Agents Chemother. 2004;48:1763–5.



**Basavaprabhu Achappa<sup>1</sup>, Nikhil Victor Dsouza<sup>2</sup>**

*<sup>1</sup>Associate professor, Department of General Medicine, Kasturba Medical College Mangalore, Manipal Academy of Higher Education.*

*<sup>2</sup>Senior Resident, Department of General Medicine, Kasturba Medical College Mangalore, Manipal Academy of Higher Education.*

### **Introduction:**

Meningoencephalitis is a common neurological infection commonly caused by mycobacterium tuberculosis and few other viruses. We present a case report of an uncommon, non-infective cause of meningoencephalitis in a young male.

In 1972, Kikuchi Fujimoto disease was reported first in Japan. It is described as histiocytic necrotizing lymphadenitis which is self-limiting and clinically presents as cervical lymphadenopathy along with fever and other systemic symptoms. <sup>1</sup>The systemic manifestations are rare and furthermore the nervous system involvement is very rare.

Here is a patient who reported with acute febrile illness and convulsions, on evaluation was found to have meningoencephalitis which was caused by Kikuchi Fujimoto disease.

### **Case Presentation:**

A 22 years old male reported with history of fever since 5 days, vomiting since 2 days coffee brown in colour with altered sensorium of 1 day duration. Fever was high grade associated with chills and rigors, headache and generalized weakness. One episode of seizure as reported as well. For the above complaints he was treated with IV antibiotics at a local hospital but the fever persisted.

On arrival to our hospital, examination revealed the patient was drowsy with Glasgow Coma Scale of 7/15, Pulse 80/minute, blood pressure 130/80 mmHg and Respiratory Rate of 22 breaths/minute. Bilateral multiple cervical lymph nodes. On Neurological examination, pupils were bilaterally equal and reactive; Neck Rigidity was present, Bilateral Plantar extensor. After admitting him in the intensive care unit (ICU) he had an episode of generalized tonic clonic seizures.

The differential diagnosis at present was viral meningoencephalitis (herpes simplex virus/dengue), tubercular meningitis, typhoid encephalopathy, cerebral malaria and bacterial meningitis.

### **Investigations:**

Blood investigations for fever work up were done (Table 1). Magnetic resonance imaging (MRI), Lumbar Puncture (LP) with CSF analysis were planned.

Radiological investigations were done – Chest X-ray and MRI Brain were normal and Ultrasound abdomen revealed hepatosplenomegaly.

In view of the above investigations not yielding a diagnosis, LP was done and the CSF analysis is given in table 2.

Following the extensive work up the differential diagnosis remained the same. Hence the patient was treated with IV ceftriaxone, IV acyclovir, Oral doxycycline, IV levetiracetam and IV dexamethasone. His condition improved over a period of 2 days and was shifted out of ICU. Acyclovir was withdrawn as the CSF virology and MRI brain was negative. On day 5 he was discharged as he wanted to continue the same treatment at a nearby hospital.

The patient returned after five days with low grade fever and painful swelling in the right side of the neck. On examination he had palpable bilateral cervical Lymph nodes with the largest swelling on the right cervical region 2x2 cm soft tender mobile and not matted. He was admitted and blood investigations revealed WBC count and ESR elevated. Blood culture and Mantoux test were negative. With the above clinical picture, the differential diagnosis now were disseminated TB with meningitis, non-Hodgkin's lymphoma, viral meningoencephalitis and typhoid encephalopathy.

Fine needle aspiration cytology (FNAC) was performed which showed granulomatous lymphadenopathy suggestive of TB lymphadenitis but was negative for Acid fast bacilli (AFB) staining (Figure 1). Due to this dilemma, Lymph node biopsy was done. This revealed features suggestive of Kikuchi-Fujimoto Disease i.e. histiocytic necrotizing lymphadenitis (Figure 2 and 3). With this we arrived at a confirmatory diagnosis of Systemic Kikuchi-Fujimoto's disease with Aseptic meningoencephalitis.

### **Discussion:**

Kikuchi Fujimoto disease is a rare, benign self-limiting disease mainly affecting the cervical lymph nodes leading to lymphadenopathy in the cervical region. It is usually associated with fever and night sweats. 2

Cervical lymphadenopathy is the commonest clinical manifestation of Kikuchi disease either with systemic signs and symptoms or without. It consists of lymph node enlargement ranging from 0.5 to 4 cm in size associated with pain and tenderness. Chien-Yu Cheng et al studying 195 cases of lymphadenitis found the distribution to be in the jugular (77.4%), supraclavicular (10.5%), sub mental (9.4%) and axillary (2.6%) areas respectively. Though mostly unilateral, they found bilateral cervical lymphadenopathy in 23.1% of patients.3

The etiology of this disease is still unknown and a few investigators are of the opinion that the disease is a kind of hyper-immune lymphadenitis which is induced by sensitized T cells. But characteristic features have not been detected.

Though the disease affects Asians more often, it is gaining recognition world over. There have been several reports and few series published from India with the first case published by LG Mathews et al in 1998.(4)

One of the common causes for lymphadenitis in India is still tuberculosis and these patients are often treated with antitubercular therapy without confirmatory evidence. As the disease is self-limiting, it is likely that many of these cases could be missed.

Initially it was reported that there was a female preponderance for this disease (female:male ratio 4:1), it is now considered that men can be afflicted equally (1:1). Most of the cases reported are young adults under the age of 30 though sporadically patients over this age have been reported.(5)

This disease should be considered as a differential diagnosis of lymphadenitis. Common manifestations of this are cervical lymphadenopathy, rarely generalized lymphadenopathy, and associated flu like syndrome in almost half of the patients which includes fever, headache, vomiting, arthralgia, myalgia and weight loss.

Our case had clinical features of meningitis and this adds to the confusion at arriving at a diagnosis. Although the involvement of the nervous system is rare, neurological manifestations which have been reported are meningitis, acute brachial neuritis, acute cerebellar ataxia and brainstem encephalitis. A study done by Y Sato et al suggested that meningitis like picture is more common in males than females which has been seen in our case as well. (6)

The confirmatory diagnosis is done by histopathology study of the affected lymph nodes. Though many claimed, as in our case presented that with FNAC, a proper diagnosis cannot be ascertained. Mehboob Hasan et al opined that biopsy of the lymph node is more invasive than FNAC and should not be the first preferred method unless reported as negative. But FNAC will be able to offer a firm diagnosis in experienced hands and thus obviating the need for biopsy. FNAC, if needed could be repeated.(7)

## Conclusion:

A case presenting as meningitis with cervical lymph nodes should have prompted a diagnosis of Kikuchi - Fujimoto Disease. The condition being far less frequent than other causes of meningitis made the delay possible. In India, lymph node enlargement is frequently associated with Tuberculosis and hence the primary thought is often directed towards it, which by itself is a more serious disease than Kikuchi - Fujimoto Disease. Anti-Koch's treatment by itself has several side effects including resistance and hence a definite diagnosis is warranted prior to commencing Anti-Koch's regimes. A lymph node biopsy at earlier stage of presentation could have given a conclusive diagnosis. Kikuchi - Fujimoto Disease, though rare, many reports are now available from India and hence should be considered in the differential diagnosis of lymph node enlargement, especially of the cervical nodes.

## Tables

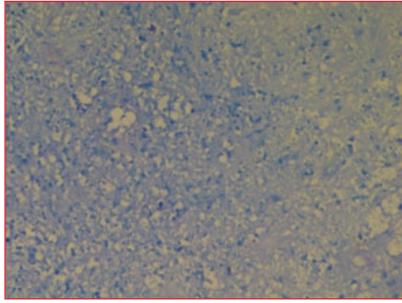
INVESTIGATION	RESULT	INVESTIGATION	RESULT
Hemoglobin (g/dL)	12.8	Malaria	Negative
WBC count (cells/ $\mu$ l)	9 x 10 <sup>3</sup>	Dengue IgM	Negative
Neutrophil/lymphocyte (%)	75/24	Weil felix test	Negative
ESR (mm/hr)	45	Blood culture	No growth
ALT/ALP (IU/L)	55/134	Urine culture	No growth
Urine	Blood ++++	Widal test	Negative
	Pus 8-10/Hpf	HIV/HBsAg	Negative
Peripheral smear	Neutrophilic leukocytosis with thrombocytopenia		

**Table 1:** Table showing blood investigations done and their results.

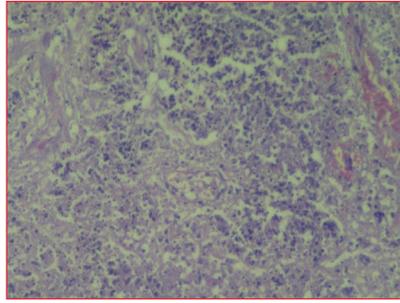
INVESTIGATION	RESULT	INVESTIGATION	RESULT
Colour	Slightly hazy	Ziehl Neelsen stain	Negative
Glucose (mg/dL)	62	Gene Xpert test	Negative
Protein (mg/dL)	105.9	Culture	No growth
Chloride (mmol/L)	130.6	JE virus / enterovirus	Negative
Cells (Hpf)	280	HSV1&2, VZV	Negative
Neutrophil/Lymphocyte(%)	4/93	KFD	Negative

**Table 2:** Table showing the parameters and results of the CSF analysis of the patient

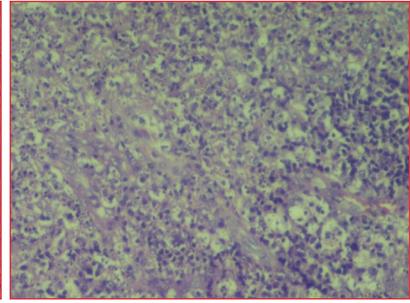
## Figures:



**Figure 1:** Ziehl Neelsen staining which is negative for acid fast bacilli.



**Figure 2:** Picture showing areas of necrosis with karyorrhectic nuclear debris



**Figure 3:** Picture showing sheets of histiocytes, some of which have crescentic nuclei

## References:

1. Hutchinson CB, Wang E. Kikuchi-Fujimoto disease. *Arch Pathol Lab Med.* 2010 Feb;134(2):289-93.
2. Bosch X, Guilbert A, Miquel R, Campo E. Enigmatic Kikuchi-Fujimoto disease: a comprehensive review. *Am J Clin Pathol.* 2004 Jul;122(1):141-52.
3. Cheng CY, Sheng WH, Lo YC, Chung CS, Chen YC, Chang SC. Clinical presentations, laboratory results and outcomes of patients with Kikuchi's disease: emphasis on the association between recurrent Kikuchi's disease and autoimmune diseases. *J Microbiol Immunol Infect.* 2010 Oct;43(5):366-71.
4. Mathew LG, Cherian T, Srivastava VM, Raghupathy P. Histiocytic necrotizing lymphadenitis (Kikuchi's disease) with aseptic meningitis. *Indian Pediatr.* 1998 Aug;35(8):775-7.
5. Lin HC, Su CY, Huang CC, Hwang CF, Chien CY. Kikuchi's disease: a review and analysis of 61 cases. *Otolaryngol Head Neck Surg.* 2003 May;128(5):650-3.
6. Sato Y, Kuno H, Oizumi K. Histiocytic necrotizing lymphadenitis (Kikuchi's disease) with aseptic meningitis. *J Neurol Sci.* 1999 Mar 1;163(2):187-91.
7. Hasan M, Zaheer S, Sofi LA, Parvez A. Fine-needle aspiration cytology of Kikuchi Fujimoto disease. *J Cytol.* 2009 Jan;26(1):43-5.



Hema Kini<sup>1</sup>, Divyakshi Singh<sup>2</sup>, Saraswathy Sreeram<sup>1</sup>,  
Keshav Prasad<sup>3</sup>

<sup>1</sup>Department of Pathology, Kasturba Medical College, Mangalore

<sup>2</sup>MBBS, Undergraduate, Kasturba Medical College, Mangalore

<sup>3</sup>Department of General Surgery, Kasturba Medical College, Mangalore

### Abstract

Hydatid disease is a parasitic infection caused by *Echinococcus* sp. The definitive hosts are usually carnivores such as dogs, while the intermediate hosts are herbivores such as sheep and cattle. Humans are accidental hosts and the parasitic infection cycle reaches a dead end within their organs. A 60-year-old man presented with yellowish discoloration of the eyes, pain in the upper abdomen, vomiting since one month and fever since two days. Intra operatively, in addition to the hydatid cysts in the liver and lesser sac, an incidental stricture detected in the transverse colon, proved to be a mucinous adenocarcinoma arising in an adenomatous polyp. We present this case because of the rare synchronicity of hepatic hydatid disease with colonic malignancy.

### Keywords

Echinococcus; hepatic cyst; colorectal carcinoma

### Introduction

Hydatid disease is a parasitic infection by *Echinococcus* sp., of which *E.granulosus* and *E.multilocularis* are the common species in human infections. The definitive hosts are normally carnivores such as dogs, while the intermediate hosts are herbivores such as sheep and cattle. Humans are accidental hosts and the parasitic infection cycle reaches a dead end within their organs. This infection may be acquired by contact with infected definitive host and infected feces, plants or soil with direct mouth to hand transfer. The worldwide incidence of Echinococcosis is about 1-3 lakh annually with the highest incidence in Europe. In India its prevalence has been reported, mainly in Andhra Pradesh, Saurashtra and Tamil Nadu.[1] We present an uncommon case of hydatid disease of the liver with an incidental colonic malignancy detected on table.

### Case Report

A 60-year-old man, an agricultural laborer, presented with yellowish discoloration of the eyes, pain in the upper abdomen and vomiting since one month. He also complained of having fever since two days. He had no previous history of drug allergies, though he had taken some ayurvedic medicines for jaundice. There was no history of diabetes mellitus, hypertension, tuberculosis, surgery or significant family history. He was a chronic alcoholic and had been smoking for the past 20 years.

On examination, he was anemic and icteric. His vitals were normal. Upper abdomen was distended. All the four quadrants moved regularly with respiration during inspection. On palpation, liver was enlarged, 10 cm below costal margin with rounded borders. There was no splenomegaly and bowel sounds were normal. Liver function tests showed a high alkaline phosphatase (ALP), total and direct bilirubin. Contrast Enhanced Computed Tomography (CECT) of abdomen showed well-defined cystic lesions measuring 11.4x10x8.7 cm with multiple locules in lesser sac. Wall calcification was noted. The lesion was seen to posteriorly compress the pancreas and common bile duct (CBD).

Liver was enlarged with heterogeneous distention and nodular surface measuring 20 cm. Presence of non-enhancing lesion with coarse calcification was noted in sixth segment measuring 55x49x47 mm. Portal veins appeared enlarged measuring 14mm in caliber. Common hepatic duct (CHD) and CBD were dilated, measuring 9 mm.

The patient underwent laparotomy for hydatid cyst of liver and lesser sac. Findings included presence of a 7x7 cm size hard walled cyst attached to liver parenchyma, which was removed. Lesser sac also had a 7x5 cm cyst. In addition to cystic hydatidosis, an incidental stricture in the transverse colon was resected and submitted for histopathology. The colonic segment surprisingly revealed mucinous adenocarcinoma arising in an adenomatous polyp. The patient was treated with chemotherapy and anti-helminthic therapy post-surgery and remains well on follow-up of two years.

## Discussion

Colorectal cancer is globally the third most common cancer in man and the most common malignancy in Asia. Genetic and environmental factors have been implicated in causation of CRC. [2] Hydatid cyst is a zoonotic disease occurring particularly in those areas where people are involved in cattle rearing. It is endemic in India as well. *E. granulosus* is common globally and *E. multilocularis* is more common in the Western world. [1] *E. granulosus* generally manifests as cystic *Echinococcosis*. *E. granulosus* multiplies by internal budding forming brood capsules. The commonly affected organs are the liver and lungs, however any organ can be affected. [1,3]

There are three layers in the cyst wall: (i) pericyst, the outermost layer made up of calcification and dense fibrovascular tissue (ii) avascular laminated membrane, and (iii) innermost germinal layer, containing the brood capsules showing suckers. The outermost layer shows inflammation and compresses the surrounding liver parenchyma. [4]

Echinococcosis has been reported with hepatocellular carcinoma in 12 published cases along with rare reports of co-existence with rectal, gastric and ovarian tumors. [3-6] A series of four cases from India showed its coexistence with esophageal adenocarcinomas. [7] In all these cases, hydatid cyst was situated in the liver. Charatsi and colleagues reported a peculiar case in which cystic Echinococcosis was detected with concurrent serous adenocarcinoma in the same ovary. [8] Likewise, a case from Turkey was reported with concurrent lymphoepithelioma-like carcinoma of stomach, pelvic hydatid cyst and borderline serous tumor of ovary. [3] In spite of its high prevalence, incidental diagnosis of hydatid disease among patients undergoing surgery for various solid tumors was noted in an extremely low frequency. In most of the case reports published till date of synchronous carcinoma with hydatid cyst, it was the echinococcal cyst, which was detected incidentally and thought to be hepatic metastases. In our case, malignancy was detected incidentally during the surgery. The transverse colon stricture was missed on initial imaging studies. In our case, colectomy was done simultaneously with the hydatid cystectomy.

A recent advance is the finding of common antigens between hydatid cyst and various cancers. This Tn antigen is said to cross react with secretory product of cancer cells. [9] Reports on colon carcinoma being successfully eliminated by hydatid cyst fluid injection in animal models have gained much attention. [10] This latest antitumor mechanism, however, does not explain the co-existence of both these conditions.

Ultrasonography is fairly sensitive in diagnosing Echinococcal cyst, however, computed tomography is more efficient in picking up calcifications and daughter cysts. [3] Hydatid cysts are usually treated by open surgery. However, percutaneous alcohol injection, percutaneous thermal ablation and chemotherapy have been tried successfully to treat the same. [4] Presence of a hydatid cyst with carcinoma does not significantly affect surgical management. However, care is needed to prevent intraoperative peritoneal dissemination of the cyst contents.

Echinococcosis is one of the most common diseases affecting the eastern countries, mainly the rural areas. Out of all the carcinomas of the gastrointestinal tract, colorectal carcinoma affects developing countries to the maximum. The coexistence of both of these diseases is extremely rare. Careful pre-operative evaluation is required to decide on appropriate line of therapy for both.

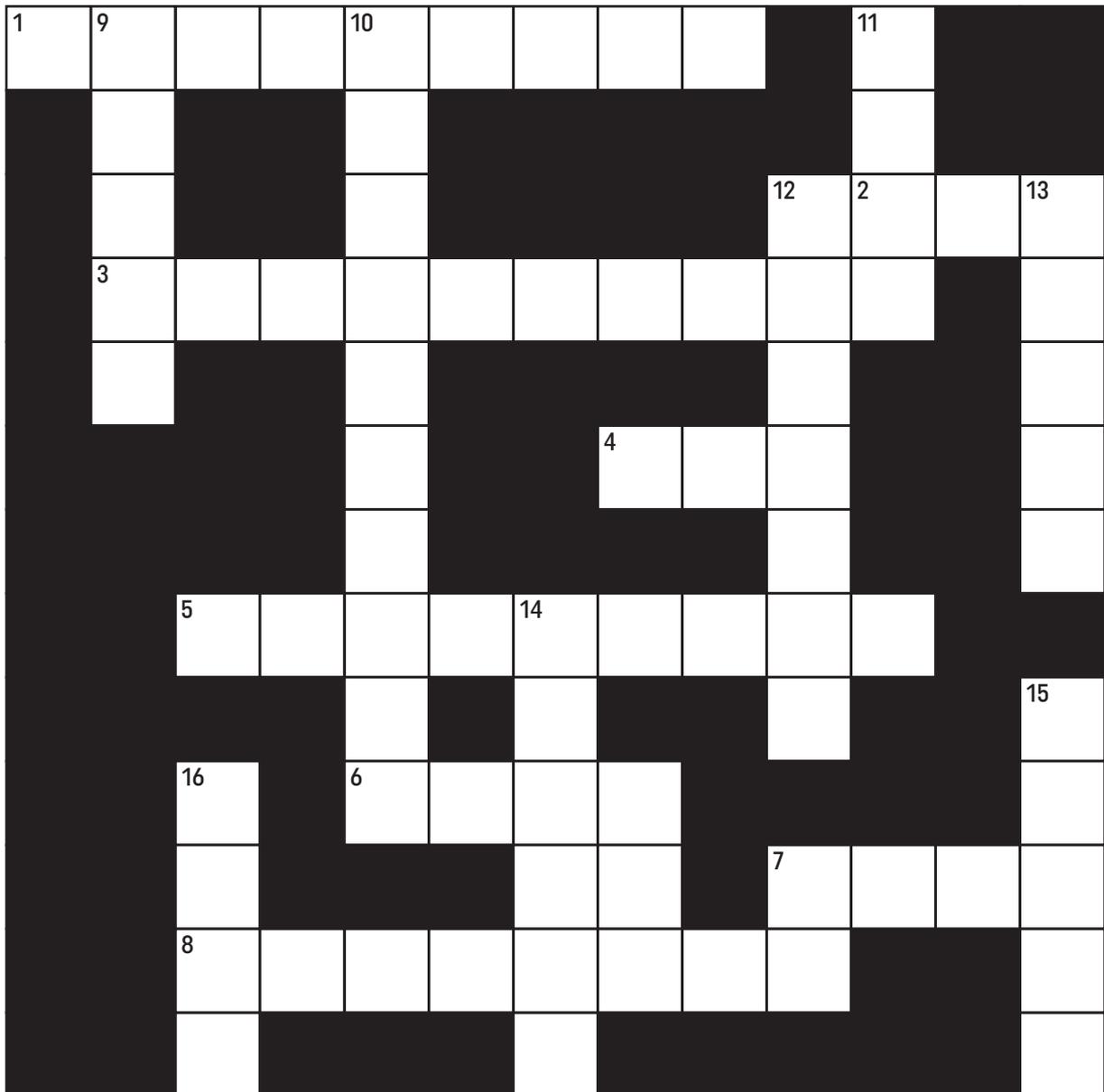
## References:

1. Rao SS, Mehra B, Narang R. The spectrum of hydatid disease in rural central India: An 11-year experience. *Ann Trop Med Public Health* 2012;5:225-30.
2. Pourhoseingholi MA. Increased burden of colorectal cancer in Asia. *World J Gastrointest Oncol* 2012; 4(4): 68-70.
3. Gungor T, Altinkaya SO, Sirvan L, Lafuente RA, Ceylaner S. Coexistence of borderline ovarian epithelial tumor, primary pelvic hydatid cyst, and lymphoepithelioma-like gastric carcinoma. *Taiwan J Obstet Gynecol* 2011; 50: 201-4.
4. Romic B, Romic I, Petrovic I, Romic M, Romic R, Romic M, et al. A Synchronous Occurrence of Hepatocellular Carcinoma and Echinococcal Liver Cyst - Can Parasite Promote Carcinogenesis? Literature Review and Classification Proposal. *Chirurgia (Bucur)*. 2016;111(4):297-303.
5. Peker K, Inal A. Concurrent Echinococcal disease with colorectal carcinoma: reports of two cases. *JAREM* 2013;3:123-5.
6. Li H, Song T, Shao Y, Wen H. Cystic echinococcosis accompanied by hepatocellular carcinoma in a female herdsman. *Int J Clin Exp Med* 2015;8(2):2985-8.
7. Ghosh JK, Goyal SK, Dixit VK, Jain AK. Four cases of adenocarcinoma of esophagus with co-existing hydatid cyst of liver which caused delayed management of carcinoma esophagus. *Indian J Gastroenterol*. 2015;34(1):84-5.
8. Charatsi DI, Kotsopoulos IC, Xirou P, Valeri RM, Kaplanis K. Synchronous adenocarcinoma and echinococcus in the same ovary: a rare clinical entity. *Hippokratia* 2015;19(1):88-91.
9. Daneshpour S, Bahadoran N, Hejazi SH, Eskandarian AE, Mahmoudzadeh M, Darani HY. Common antigens between hydatid cysts and cancers. *Adv Biomed Res* 2016;5:9. doi: 10.4103/22779175.175242.
10. Berriel E, Russo S, Monin L, Festari MF, Berois N, Fernandez G, et al. Antitumor Activity of Human Hydatid Cyst Fluid in a Murine Model of Colon Cancer Immune biasing by helminth glycans. *Sci World J*. 2013; Article ID:230176. <http://dx.doi.org/10.1155/2013/230176>.



Figure legends

Fig. 1. (a): Computed tomography showing cyst in liver and lesser sac. (b): Intraoperative image of hydatid cyst (c): Macroscopic image of hydatid cyst (d): Macroscopic image of transverse colonic stricture (e): Echinococcal cyst - lamellated membrane (H&E, 10x) (f): Scolices and hooklets of Echinococcus (H&E, 20x) (g): Tubular adenoma (H&E, 10x) (h): Carcinoma cells floating in mucin (H&E, 10x)

**Across**

1. Treatment for ESBL producing bacteria
2. Definitive host for *Toxoplasma gondii*
3. Parasite imported from the mediterranean
4. Molecular Diagnostic test
5. Genus of Whipworm
6. Virus associated with camels
7. The barking cough
8. If you don't boil your milk, you may have this!!

**Down**

9. Marburg and I are viruses of the same family.
10. If you have me, you have malaria.
11. The gene that encodes resistance for MRSA
12. Beaver Fever
13. Source of Lymes disease
14. I'm common, but not so simple. I leave you with an itch.
15. Kerala. . .bats. . .virus
16. I'm tender, painful and caused by a flea.



# Section IV

Pictus...MAC ID in Pictures



# Manipal McGill Infectious Diseases International Conference

11th & 12th August 2018



## World Hospice and Palliative Care Day

2nd October 2018



## Workshop Standard methods in evaluation of antimicrobials

10th & 11th December 2018



CME on Recent Updates in Tuberculosis Management

9th & 12th January 2019



Guest Lecture on " Will SmartApps Plug Health Service Delivery Gaps?  
Evidence from South Africa, Canada and India"

10th & 11th December 2018



## Workshop on Polymerase Chain Reaction for Diagnosing Infectious Pathogens

1st March 2019



## Safe Travel Symposium

23rd March 2019



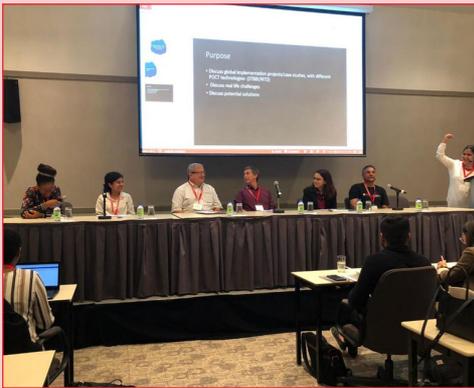
## CME on Outbreaks of emerging and re-emerging infections

30th March 2019



## McGill Summer course

10th -21st June, 2019



# Section V

Laurus...MAC ID  
Faculty achievements



## (I) Recognitions



Dr Chiranjay Mukhopadhyay, Dr Kavitha Saravu and Dr Vandana KE were invited as Experts for group meeting on Melioidosis in National Center for Disease Control, New Delhi on 23rd April 2019 and they discussed and finalized the draft of Communicable Diseases alert (CD Alert) on Melioidosis.

Dr Kavitha Saravu authored a chapter on "Malaria" in the 11th edition of Association of Physicians of India Text book (API Text Book) of Medicine, Jaypee publishers.

Dr Vasudeva Acharya authored a chapter on "Inhibitors of cell wall synthesis" in the 11th edition of Association of Physicians of India Text book (API Text Book) of Medicine, Jaypee publishers.

"Characterisation of Haematological parameters and potential role of platelet parameters to predict severity in malaria" Pranjali Gupta, Kavitha Saravu, was awarded FIRST PRIZE for poster category in Clinical Infectious Diseases Conference, CIDSCON 2018 at CMC Vellore, Tamil Nadu held from 16th -18th August 2018.

"Determination of severity, in- hospital outcomes and Recurrences in Malaria: A Prospective cohort study from a tertiary care center", Divya Gandrala, Saravu K, was awarded FIRST PRIZE in paper category in CIDSCON 2018 at CMC Vellore, Tamil Nadu held from 16th -18th August 2018.

## (II) Projects

Sl. No	Name of the funding agency	Investigators	Project title	Amount Sanctioned
1	IC-IMPACTS (full name: India-Canada Centre for Innovative Multidisciplinary Partnerships to Accelerate Community Transformation and Sustainability)	<b>Dr Nitika Pant Pai</b> , Associate Professor, Department of Medicine, McGill University, Canada & <b>Dr Suma Nair</b> , Professor & HOD, Department of Community Medicine, KMC, Manipal, <b>Dr Sneha Deepak Mallya</b> , Associate Professor, Department of Community Medicine, KMC, Manipal.	Smart app-based rapid multiplex screening of HIV associated co-infections of at-risk populations at the point-of-care: A demonstration study in India	CAD \$25,000
2	Grant Challenges Canada	<b>Dr Nitika Pant Pai</b> , Associate Professor, Department of Medicine, McGill University, Canada & <b>Dr Suma Nair</b> , Professor & HOD, Department of Community Medicine, KMC, Manipal, <b>Dr Sneha Deepak Mallya</b> , Associate Professor, Department of Community Medicine, KMC, Manipal.	Will an Emoji pendant empower rural young women to make smart reproductive choices?	
3	Erasmus+ Capacity Building for Higher Education, Chitkara University, Chandigarh, India.	<b>Dr Helmut Brand</b> , Director, Prasanna School of Public Health, MAHE, Manipal, <b>Dr Chiranjay Mukhopadhyay</b> , Associate Dean, KMC, Manipal, Professor, Department of Microbiology, KMC, Manipal. <b>Dr Vandana KE</b> , Professor, Department of Microbiology, KMC, Manipal, <b>Dr Shah Hossain</b> , Associate Professor, Department of Public Health, MAHE, Manipal, <b>Stefano Greco</b> , Founder Director   Chitkara Spaak Centre for Multidisciplinary European Studies	PREVENT IT- Risk management and prevention of antimicrobial resistance	
4	McGill Interdisciplinary Initiative in Infection and Immunity (MI4)	<b>Dr Madhukar Pai</b> , Director, McGill Global Health Programs, McGill University, Canada & <b>Dr Kavitha Saravu</b> , Professor, Department of Medicine, KMC, Manipal.	"A Deadly Combination: Air Pollution and TB in India"	INR 7,00,000
5	Research Institute of the McGill University Health Center	<b>Dr Madhukar Pai</b> , Director, McGill Global Health Programs, McGill University, Canada & <b>Dr Kavitha Saravu</b> , Professor, Department of Medicine, KMC, Manipal.	Fake Drugs Real Problems: Substandard TB and Malaria drugs in India	INR 5,02,188
6	Hemex Health, USA	<b>Dr Kavitha Saravu</b> , Professor, Department of Medicine, KMC, Manipal, <b>Dr Shashikiran Umakanth</b> , Professor, Department of Medicine, Dr TMA Pai Hospital, Udupi, <b>Dr Sushma Belurkar</b> , Associate Professor, Department of Pathology, KMC, Manipal	Malaria Clinical Accuracy study of a novel point of care test	INR 15,19,360
7	Vision group of science and technology, Dept. of Information Technology, Biotechnology and Science & Technology, Govt. of Karnataka	<b>Dr Usha Y Nayak</b> , Associate Professor, Department of Pharmaceutics, Manipal College of Pharmaceutical Sciences (MCOPS), MAHE, Manipal.	Formulation optimization of novel anti-HIV fixed dose combination Nanosuspension formulation	INR 5,00,000

### (III) Awards



**Dr Kavitha Saravu** MBBS, MD, DNB, DTM&H (London)

*Professor & Unit Chief of Medicine,  
Chief, Infectious Diseases Clinic, Kasturba Medical College & Hospital,  
Manipal  
Co-Ordinator, Manipal Center for Infectious Diseases, MAHE, Manipal*

Dr Kavitha Saravu received Faculty Award for Research Publication 2018



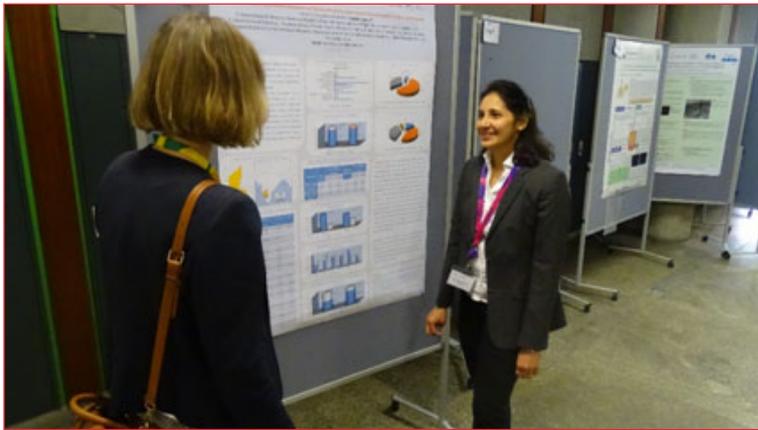
**Dr T.S Murali** Phd

*Associate Professor,  
Department of Biotechnology, Manipal School of Life Science, Manipal*

Awarded the Endeavour Executive Fellowship to visit Deakin University, Australia for a period of three months from August to November 2018



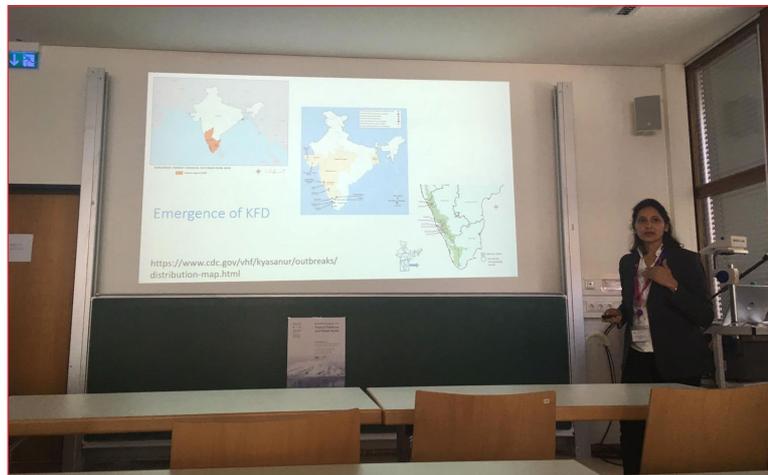
#### (IV) International Conference presentations



Dr Kavitha Saravu Presented a poster titled "Predictors and treatment outcomes of extra pulmonary tuberculosis from an Indian Tertiary care hospital" at conference on **Clinical Tropical Medicine and Global Health** held on 5th April 2019 at Munich, Germany.



Dr Kavitha Saravu gave a talk on "Spectrum, severity and treatment outcomes of Kyasanur Forest Diseases: Experience from the 2019 Outbreak in Karnataka, India" at conference on **Clinical Tropical Medicine and Global Health** held on 5th April 2019 at Munich, Germany



Dr Shrikala Baliga presented a poster titled "Fluorescent In Situ Hybridisation: A Rapid Diagnostic Test for detection and Speciation of Mycobacterial Infection" at the conference on **18th International Congress of Infectious Diseases** held from 1st to 4th March 2018 at Buenos Aires, Argentina



**(I) MAC ID Affiliated Articles**

1. Commons RJ, Simpson JA, Thriemer K, Chu CS, Douglas NM, Abreha T, et al. The haematological consequences of *Plasmodium vivax* malaria after chloroquine treatment with and without primaquine: a WorldWide Antimalarial Resistance Network systematic review and individual patient data meta-analysis. *BMC Med.* 2019;17(1):151.
2. Mathews, B.; Thalody, A.A.; Miraj, S.S.; Kunhikatta, V.; Rao, M.; Saravu, K. Adverse Effects of Fluoroquinolones: A Retrospective Cohort Study in a South Indian Tertiary Healthcare Facility. *Antibiotics* 2019, 8, 104.
3. Tilak A, Shenoy S, Varma M, Kamath A, Tripathy A, Sori R, Saravu K. "Opportunistic infection at the start of antiretroviral therapy and baseline CD4+ count less than 50 cells/mm<sup>3</sup> are associated with poor immunological recovery" *J Basic Clin Physiol Pharmacol*, 30.2 (2019): 163-171
4. Mazumdar S, Satyanarayana S, Pai M. Self-reported tuberculosis in India: evidence from NFHS-4. *BMJ Glob Health* 2019;4:e001371. doi:10.1136/bmjgh-2018-001371
5. Daftary A, Satyanarayana S, Jha N, et al..Pai M. Can community pharmacists improve tuberculosis case finding? A mixed methods intervention study in India *BMJ Glob Health* 2019;4:e001417
6. Gupta P, Guddattu V, Saravu K. Characterization of platelet count and platelet indices and their potential role to predict severity in malaria. *Pathog Glob Health.* 2019 Apr 9;1-8.
7. Daniels, Benjamin, Ada Kwan, SatyanarayanaS, Ramnath S, Ranendra K Das, V Das, Das J, M Pai. Use of standardised patients to assess gender differences in quality of tuberculosis care in urban India: a two-city, cross-sectional study *Lancet Glob Health*, Volume 7(5), e633 - e643
8. Manda V, Josyula VR, Hariharapura RC. siRNA intervention inhibiting viral replication and delivery strategies for treating herpes simplex viral infection. *VirusDis* 2019;
9. Furin J, Cox H, Pai M, Tuberculosis, *The Lancet*, 2019, ISSN 0140-6736.
10. Kiran J, Rajeshwari HR, Swapnil D, Satveer J, Dinesh D, Sunil J, Karthikeyan S, Dwarkadas B, Phytosynthesis of gold nanoparticles: Characterization, biocompatibility, and evaluation of its osteoinductive potential for application in implant dentistry; *Materials Science and Engineering: C*, Volume 93, 2018, 664-670, ISSN 0928-4931.
11. Mudgal J, Mudgal PP, Kinra M, Raval R. Immunomodulatory role of chitosan-based nanoparticles and oligosaccharides in cyclophosphamide-treated mice. *Scand J Immunol.* 2019;e12749.
12. Aparajita C, Shipra R, Vasudeva G, Chiranjay M, Saravu K. Is Methicillin Resistant *Staphylococcus Aureus* infection associated with higher mortality and morbidity in hospitalized patients? A cohort study of 551 patients from South Western India. *Risk Manag Healthc Policy.* 2018:111-8.
13. MacLean E, Saravu K, Pai M. Diagnosing active tuberculosis in people living with HIV. *Curr Opin HIV AIDS.* 2018 October
14. Tulasidas S, Rao P, Bhat S, Manipura R. A study on biofilm production and antifungal drug resistance among *Candida* species from vulvovaginal and bloodstream infections. *Infect Drug Resist.* 2018;11:2443-2448. Published 2018 Nov 23. doi:10.2147/IDR.S179462.
15. Kwan A, Daniels B, Saria V, Satyanarayana S, Subbaraman R, McDowell A, et al..M Pai. Variations in the quality of tuberculosis care in urban India: A cross-sectional, standardized patient study in two cities. 2018; *PLoS Med* 15(9): e1002653.
16. Saravu, K., Tellapragada, C., Kulavalli, S., Xavier, W., Umakanth, S., Brahmarouphu, G., Bhat, K. A pilot randomized controlled trial to compare the effectiveness of two 14-day primaquine regimens for the radical cure of vivax malaria in South India. 2018; *Mal J*, 17, 321.

Crossword solutions (for Crossword on Pg 51)

<sup>1</sup> M	<sup>9</sup> E	R	O	<sup>10</sup> P	E	N	E	M		<sup>11</sup> M		
	B			L						E		
	O			A					<sup>12</sup> G	<sup>2</sup> C	A	<sup>13</sup> T
<sup>3</sup> L	E	I	S	H	M	A	N	I	A			I
A			M						A			C
			O			<sup>4</sup> P	C	R				K
			D					D				S
	<sup>5</sup> T	R	I	C	<sup>14</sup> H	U	R	I	S			
			U		E			A				<sup>15</sup> N
	<sup>16</sup> B		<sup>6</sup> M	E	R	S						I
	U				P				<sup>7</sup> C	R	O	P
	<sup>8</sup> B	R	U	C	E	L	L	A				A
	O				S							H

Crossword compiled by:  
**Dr Cynthia Amrutha**  
 Assistant Professor  
 Department of Medicine  
 KMC, Manipal





# Section VI

Mustus.... Upcoming  
ID conference details



## National ID Conferences

- 1) Name: CIDSCON 2019  
Date: 23 -25 August 2019  
Place: Kochi, Kerala  
URL: <http://cidscon.in/main/>
- 2) Name: International Science Symposium on HIV & Infectious Diseases  
Date: 12- 14 October 2019  
Place: Chennai, India  
URL: <http://isshid2019.org/>
- 3) Name: MicroCon 2019  
Date: 29 November – 1 December 2019  
Place: Nehru Centre, Mumbai  
URL: <http://microcon2019.org/>
- 4) Name: APICON 2020  
Date: 06 -09 January 2020  
Place: Kunjamal N Convention Center, Agra  
URL: <http://www.apicon2020agra.com/>

## International ID Conferences

- 1) Name: 5th ESCMID Conference on Vaccines  
Date: 6-8 September 2019  
Place: Bilbao, Spain  
URL: [https://www.escmid.org/research\\_projects/escmid\\_conferences/5th\\_vaccines\\_conference/](https://www.escmid.org/research_projects/escmid_conferences/5th_vaccines_conference/)
- 2) Name: World Congress on Antibiotics and Antimicrobial Resistance  
Date: 23-24 September 2019  
Place: Rome, Italy  
URL: <https://antibiotics.pulsusconference.com/>
- 3) Name: ID Week 2019  
Date: 02-06 October 2019  
Place: Washington, DC  
URL: <https://www.idsociety.org/events2/events/2019/October/idweek-2019/>
- 4) Name: 4th Global conference on Virology & Vaccines  
Date: 14-16 October 2019  
Place: Osaka, Japan  
URL: <http://virologycongress.com/osaka/>
- 5) Name: Meningitis and Septicaemia 2019  
Date: 02- 06 November 2019  
Place: The British Museum, Great Russell Street, London  
URL: <https://www.meningitis.org/healthcare-professionals/mrf-conference-2019>
- 6) Name: 7th Annual Conference on Parasitology & Infectious Diseases  
Date: 18-19 November 2019  
Place: Johannesburg, South Africa  
URL: <https://parasitology.infectiousconferences.com/>
- 7) Name: 5th International Conference on HIV and AIDS Research  
Date: 02-03 December 2019  
Place: Barcelona, Spain  
URL: <https://hiv-aids.infectiousconferences.com/>

# Section VII

Numus... Our Sponsors



# Sponsors

We acknowledge the support extended by our sponsors:

Platinum  
Sponsors



# Manipal Hospitals

LIFE'S ON 

Gold  
Sponsors



 GlaxoSmithKline  
Ingenium



Sliver  
Sponsors



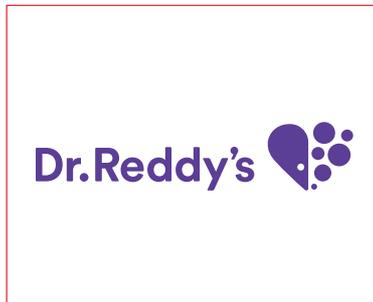
**FIND**   
Because diagnosis matters

**Emcure**  
SUCCESS THROUGH INNOVATION  
HIV Division

**Cipla**

 GlaxoSmithKline  
Fortier

**Bronze  
Sponsors**



## Opportunities for MAC ID faculty members



- Opportunity to apply for seed grants from MAC ID
- Mentoring opportunity: to receive highly qualified trainees from McGill, or to send MAHE trainees to McGill for specific skills/training
- Opportunity to participate in McGill Summer Institute courses
- Collaborate on MAC ID research projects and international grant proposals
- To learn about potential grant opportunities in the area of ID
- Members and their ID research will be showcased on the MAC ID website
- Conducting/ supporting infectious disease conference/training in Manipal/Mangalore campuses
- Conducting MAC ID international conference
- To apply for best MACID Faculty publication award

## Opportunities for MAC ID Student members



- Students can participate in the MAC ID conference
- Students can organize any ID related CME/ workshop/ Quiz etc. under the supervision of any faculty who is a MAC ID member.
- To receive important and interesting ID related articles from MAC ID
- Opportunities to participate in MACID research projects
- Opportunity for best MAC ID student publication award



**Manipal Centre for  
Infectious Diseases (MAC ID)**  
Prasanna School of Public Health  
Manipal Academy of Higher Education, Manipal

