PROCEEDINGS
OF
6th NATIONAL CONFERENCE ON

One Health - Scientific Updates on Zoonotic Diseases of Public Health importance

29th February, 2020

Organized by

Millennium India Education Foundation, New Delhi

In Association With

Mumbai Veterinary College, KEM Hospital and Seth GS Medical college Mumbai

Supported by

LIC of India, West Zone Mumbai

Venue

Mumbai Veterinary College, Parel, Mumbai-400 012

Program Schedule			
9.00- 10.00	Registration and Tea		
10.00-10.20	**Inauguration** Welcome address by Dr A.S.Ranade, Assoc. Dean, MVC, Mumbai		
10.20-10.40	Address Ms Suman Shrivastav, Sr Advisor, MIEF Mumbai		
10.40-10.50	Address by Prof. D.N. Shenvi, Seth G S Medical College & KEM Hospital, Mumbai		
10.50-11.15	Address by Chief Guest :Dr. A.T. Sherikar, Hon'ble Founder Vice Chancellor, MAFSU, Nagpur		
11.15-11.30	Vote of Thanks by Dr. R.J. Zende, Professor, Mumbai Veterinary College, Parel, Mumbai		
11.30-1145	**Tea Break**		
11.45- 12.25	Key Note Address by Dr. A. Samad, Ex. Dean, Faculty of Vet. Science, MAFSU, Nagpur. Topic: Understanding One Health Approach to implement Brucellosis Control Program		
12.25-12.45	Presentation by Sh M K Ghora Regional Manager (Health) LIC West Zone Mumbai		
12.45-14.00	**Lunch**		
Scientific Sessions			
	Topic	**Speaker**	**Chairman/ Co-chairman**
Session I:	**One Health Approach to Prevent Zoonotic Diseases of Public Health Importance**		
14.00-15.15	Perspective in Veterinary sector	Dr. V. S. Waskar, Prof. of Vet. Public Health, KNPCVS, Shirwal.	Chairman :Dr. A. T. Sherikar, Ex. Vice Chancellor, MAFSU Co-Chairman: Dr.Satyawrat Kulkarni, Head Quality Assurance, Abbott Nutrition, Mumbai.
	Perspective in Veterinary sector	Dr. Sunil Kuyare, Associate Prof., G. S. Medical College, Mumbai.	
	Ayush Perspectives	Dr. Vijay Kushwaha, Ayush Expert	
	Corona Virus Outbreaks in Recent Decade: Lesson Learned	Dr. Yogesh K. Gurav, Scientist E, ICMR-NIV, Pune.	
Session II:	**Mycobacteriosis and Leptospirosis**		
15.15-16.00	Mycobacteriosis -Challenges encountered in livestock & poultry	Dr.Shoorvir Singh, HOD, Dept. of Microbiology and Biotechnology, GLA University, Mathura	Chairman: Dr. Jyoti Misri. Principal Scientist, ICAR, New Delhi. Co-Chairman: Dr. V. S. Waskar, Prof. VPH, KNPCVS, Shirwal.
	Early diagnosis approach of Leptospirosis in Human & Animal Practice	Dr. K. N. Bhilegoankar, Principal Scientist, Division of VPH, IVRI, Pune.	
Session III:	**Leishmaniasis**		
16.00-16.45	Challenges in the diagnosis faced by Medical practitioners with regard to Leishmaniasis	Dr. Ravindra Khembhave, Prof. of Community Medicine, G. S. Medical College, Mumbai	Chairman: Dr. K. N. Bhilegoankar, Principal Scientist, IVRI, Pune. Co-Chairman: Dr. R. J. Zende, HOD, Vet. Public Health, MVC, Mumbai.
	Early diagnosis approach of Leishmaniasis in Human & Animal Practice	Dr. Jyoti Misri. Principal Scientist, ICAR, New Delhi.	
16.45-17.00	**Tea Break**		
Session IV:	**Glanders**		
17.00-17.45	Challenges encountered in Medical practice towards Glanders infection	Dr. S. B. Majee, Professor, Department of Veterinary Microbiology, MVC, Mumbai.	Chairman: Dr. R. V. Gaikwad, HOD, Dept. of Vet. Medicine, MVC. Co-Chairman: Dr. V. M. Vaidya, Assistant Prof., Vet. Public Health,MVC.
17.45-18.15	**Plenary Session & Valedictory**		

Executive Summary

The 6th Annual National Conference on 'One Health – Scientific Updates on Zoonotic Diseases of Public Health Importance' was held at Mumbai Veterinary College, Parel, Mumbai on 29th February 2020 (9:00 AM to 5:00 PM). The conference was jointly organized by Millennium India Education Foundation, New Delhi, Mumbai Veterinary College, & Seth G S Medical College & KEM Hospital Parel Mumbai in association with Heart care Foundation of India, Confederation of Medical Association of Asia & Oceania and supported by Life Insurance Corporation of India West Zone,Mumbai.

The Organizing Committee comprised of Organizing Committee President Dr. Uday Kakroo, Director, Millennium India Education Foundation, New Delhi, Vice President, Dr. A. S. Ranade, Associate Dean, Mumbai Veterinary College, Secretary (Medical), Dr. D. N. Shenvi, Head of the Department of Physiology, S.G.S.M.C. & K.E.M. Hospital, Secretary (Veterinary) Dr.R. J. Zende, Professor & Head, Department of Veterinary Public Health, M.V.C. and Conveners Dr Ravindra S.Kembhavi, Professor, Dept. of Community Medicine S.G.S. M.C. & KEM Hospital, Mumbai, Dr. (Mrs) S B Majee, Professor & Head, Department of Veterinary Microbiology, M.V.C., Dr Vilas Vaidya, Assistant Professor, Department of Veterinary Public Health, M.V.C. and Ms.Suman Shrivastav, Sr.Advisor, MIEF Mumbai.

In this conference various Medical and Veterinary Professionals including speakers and guests invited for the inaugural function and also experts to chair the technical sessions of the conference took part. A total of 175 participants from medical and Veterinary and NGO sectors took active part in interactions in the different technical sessions of conference. This is 6thNational conference on the subject organized by MIEF in Mumbai. The conference focused on one health approach to prevent zoonotic diseases of public health importance, with special reference to Perspectives in Veterinary and Medical sector, (Corona Virus outbreak, Mycobacteriosis, Glanders, Leishmaniasis & Leptospirosis).

The objective of this conference has been:

1. To promote and protect the health and well-being of all species by enhancing cooperation among veterinary, medical and environmental professionals where they can interact with each other and share their experiences in preventing the spread of diseases of public health importance (both emerging and re-emerging).
2. To promote inter-sectoral cooperation in surveillance of such animal diseases, which have the potential to cross boundaries due to rapid influx of diseases world over. These diseases are associated with high morbidity and mortality rates in their new found hosts, the human beings.

Inaugural session

The conference started with the Inaugural session which was graced by Chief Guest Dr A. T. Sherikar, Hon'ble Founder Vice Chancellor, MAFSU, Nagpur, Guests of Honour Dr Abdul Samad, Hon'ble Ex Dean, Faculty of Veterinary Science, MAFSU, Nagpur; Shri M Ghora, Regional Manager (Health), LIC, West Zone, Mumbai and Organizing Committee Members. The compendium of the conference was released at the hands of Dr A. T. Sherikar and other dignitaries. The conference was inaugurated by lighting the lamp and Saraswati Pooja.

Dr. A. S. Ranade, Associate Dean, M.V.C. welcomed all the guests and participants of the said conference and briefed about the development of Mumbai Veterinary College. Further he stressed on the importance of one health, for the control of zoonoses in both human and animals. Dr. Ranade suggested about the need to develop strong multi-institutional collaborative research linkages for working together to overcome the problem of zoonotic diseases and antimicrobial resistance etc. in the country.

Ms Suman Srivastav, Sr Advisor Millennium India Education Foundation briefed about the regular MIEF activities carried out to update medical and veterinary community on various aspects of One Health by organising short trainings/ workshops/conferences in Delhi and Mumbai for both the professions for early diagnosis and treatment, prevention & control of zoonotic diseases of public health importance. She also informed that this goal is achieved by organizing one day National Conference annually since 2014, in which, veterinary and medical experts & scientists share their research & experiences in handling diseases of public health importance at field level & it helps in designing guidelines for its prevention and control. She stressed upon the existence of gap between veterinary sciences and medical field when it comes to the diseases of community health importance and the urgent need to bridge this gap on the lines of the One Health approach. She spoke about the surfacing of newer diseases in the world including India , which were historically endemic to animals and how modern times facilitates faster transport of livestock and animals, allowing rapid spread of zoonotic diseases. She also touched upon the advent of

anti-microbial resistance (AMR) and that a rise in AMR in animals is also leading to increasing AMR in Humans. Ms Suman also thanked LIC West Zone Mumbai for associating with this program in Mumbai since last many years and hoped the the company will continue to support.

Dr. D. N. Shenvi, Professor & HOD, Physiology, S.G.S.M.C. and K.E.M. Hospital, Secretary (Medical) addressed the audience. She appreciated the work being done my MIEF and by Mumbai Veterinary College in field of Public Health and also showed interest in further collaborative research work. Dr Shenvi hoped that the Ethical problem faced by the scientist while doing collaborative research work , can be overcome with help of each other in future. Dr.Shenvi also suggested that students from both Veterinary and Medical faculty should have a research mind in health aspect of both in animals and humans.

Dr. A. T. Sherikar, Chief Guest and Hon'ble Founder Vice Chancellor, MAFSU, Nagpur elucidated about the current perceptions of public health threat management that considers emergency response services from respective department require a paradigm shift. He stated that the new approach emanates from the conviction that public health threatens mitigation and preparedness should be built into the development process and it should be multidisciplinary spanning across all sectors of development. The urgency of the strategic framework is also driven inter alia by the unique features currently being faced like the incidence of novel Corona virus, Nipah virus, KFD, Avian influenza, pesticide threats, potential impact of climate change and other exotic infectious diseases etc. He further stressed that there shall be strong governance structures and aligned legal frameworks required to be established between different sectors responsible for human, animal, or ecosystem health as they generally have different mandates and often function under different sets of international standards and legal frameworks, both at international and national level.

Shri M Ghora, Regional Manager (Health), LIC, West Zone, Mumbai spoke about various LIC health schemes to take care of people of all age group and how these schemes are more useful over ongoing mediclaim schemes of other insurance companies under IRDA. According to him, hhealth insurance is the fastest growing segment in India and Compound Annual Growth Rate (CA**GR) of 20 % during the past three years (IRDAI) has been recorded. Mr Ghora emphasized that in today's country scenario, all financial planning are meaningless unless the person has health insurance as otherwise future provision for children's education, marriage of retirement gets used up in a single episode of hospitalization. .**

The inaugural session ended with vote of thanks by the organizing Secretary (Veterinary),Dr. Ravindra Zende, Professor & HOD, Department of Veterinary Public Health, Mumbai Veterinary College, Mumbai.

Recommendations

Experts from medical and veterinary fraternities delivered talks on recent updates on various zoonotic diseases posing a great threat to both human and animals in the country with special reference to Corona virus, Mycobacteriosis, Glanders, Leishmaniasis & Leptospirosis in Veterinary and Medical perspectives.

The following recommendations emerged from day long conference

1. There is a strong need of multi-institutional collaborative research work (Bipartite or tripartite collaborations should be encouraged.) involving Veterinary, Medical and Environmental Science experts to overcome the problem of zoonotic diseases and antimicrobial resistance by working under the concept of One Health in reality.
2. Digital Platform for One Health Communication in Brucellosis Control Program is critical and must be implemented in future for enhancing the rapid communication and reporting of the disease across the species. For effective brucellosis control program both *B. abortus* and *B. melitensis* shall be included.
3. The One Health concept needs to be broadly promoted within veterinary medicine and human medicine surpassing each other's commitments, obligations and priorities. The approach in one health should not be human centric but holistic including all species for prevention of zoonoti**c diseases of public health importance.**

4.` Incorporation of 'One Health' approach in regular teaching curriculum of Medical and Veterinary Science and Training programs is need of the hour.

5. Preventive health care focus is needed rather than curative treatments of diseases (as is followed in AYUSH).
6. There is a need to report promptly and openly, cases of any disease with the potential for international spread and require preparedness to deal with the challenges like COVID-19 outbreaks. The uses and implications of internet of things (IoT) technologies for mapping the spread of infection need to be the direction for future

research which will play important role in preventing the zoonotic infectious diseases.

7. Three strategies which include -Improving the scientific evidence, reducing transmission, Inter-sectoral collaboration advised to tackle zoonotic TB. Mycobacterium avian paratuberculosis (MAP) control in goat is significantly important.
8. Strengthening of diagnostic infrastructure involving both the Medical and Veterinary expertise is of today's need to overcome challenges in diagnosis of various important zoonotic diseases. For leptospirosis, there is need to develop reliable test to detect early infection, all pathogenic serovars, able to differentiate vaccinated and infected and make easily available commercially.
9. To become a reality, effective deployment of existing and new tools will be essential for Leishmaniasis. A strong political & active community participation with inter country cooperation and partnerships is required for prevention and control of disease. Appropriate diagnostic and treatment services with effective epidemiological surveillance are suggested for prevention and control of disease.
10. The Research should focus on understanding the host parasite interaction in Leishmaniasis for setting prevention and control strategies of disease.
11. Both Glanders and Meliodosis are endemic in India and require attention in diagnosis under the One-Health programme along with other zoonotic infections. There is need of validation of various tests used for diagnosis of Glanders and Meliodosis.

About organizers

Millennium India Education Foundation (MIEF*)*: MIEF a Delhi-based registered NGO with branch office in Mumbai,s has been working on One health approach in the country since 2008 by organizing annual conferences in Delhi & Mumbai on Diseases of Public Health importance of zoonotic origin. The Foundation has involved both veterinary and medical practitioners and researchers to share their experiences and scientific updates aimed at early diagnosis, effective treatment, prevention and control of these diseases. MIEF has so far organized 9 conferences in Delhi and 5 in Mumbai on this very important issue.

Mumbai Veterinary College, Parel, Mumbai: The College is established in 2nd August, 1886 and becoming first Veterinary College in Asia. The college was founded by Dr J. H. Steel who is considered as the Father of Modern Veterinary education in Indiaand is also called the Father of Modern Veterinary

Journalism. The Veterinary College was initially

housed in the vast compound of Bai

SakarbaiDinshaw Petit Hospital for Animals, Parel, Mumbai. The College has achieved more than a

century-plus tradition in educating and cultivating some of the finest veterinary and research minds in addition to contributing to the development and formulation of innovations and healing through innovative educational methods. The mission of our College is to train future veterinarians, educate

veterinarians and scientists, and improve the quality of life for both the producers and pet owners and their animals. The goal of our more than 70 faculty members is to fully integrate their teaching and research activities with outreach programs catered to benefit the animals and through them their owners in and around Mumbai and beyond.

Seth G S Medical College & KEM Hospital, Parel, Mumbai: Founded in 1926, the Seth Gordhandas Sunderdas Medical College (GSMC) and the King Edward Memorial (KEM) Hospital are amongst the foremost teaching and medical care providing institutions in India. The medical college (school provides training to about 2000 students in undergraduate, postgraduate and superspeciality medical courses; in undergraduate and postgraduate physical and occupational therapy; Masters and PhD courses in various allied specialties. A nursing school is also maintained by these institutions. With about 390 staff physicians and 550 resident doctors, the 1800 bedded hospital treats about 1.8 million outpatients and 85,000 in-patients annually and provides both basic care and advanced treatment facilities in all fields of medicine and surgery. Funded mainly by the Municipal Corporation of Greater Mumbai, these institutions render yeomen service – virtually free of cost – mostly to the underprivileged sections of the society.

Life Insurance Corporation of India (LIC): LIC is an Indian state-owned insurance group and investment corporation owned by the Government of India. The Life Insurance Corporation of India was founded in 1956 when the Parliament of India passed the Life Insurance of India Act that nationalized the insurance industry in India. Over 245 insurance companies and provident societies were merged to create the state-owned Life Insurance Corporation of India.

Topic: Understanding One-Health Approach to Implement Brucellosis Control Program in India

Speaker: Abdul Samad Ex. Dean, Faculty of Vet. Science, MAFSU, Nagpur

Lecture Plan: Requirements of the One Health

- Integration platforms
- Status of animal disease control in India – Legal Vs Actual
- Elements of Brucellosis Control Program launched in India
- Chitale: One-Health Laboratory
- Incentive Cascade Strategy for Disease Control

One Health – Integration Platforms

- Integrated approach to policy designing –
  - Brucella control program in animals only, in cattle and not in exposed human
  - Program in cattle only goat excluded – Prevalence of B. melitensis prevalence is higher
- Micro-platforms –

In the rural dairy sector there exists a platform to integrate one health: Platform to collect and exchange data

Dairy cooperatives and processors insure both animals and farmer families – Disease testing, treatment and prevention can be built around

In Urban areas – Health insurance along with pet insurance

- Macro-level Platforms: Sharing of experience – brain-storming
- Digital sharing of information in real time

Legal framework: Prevention and Control of Infectious and Contagious Diseases in Animals Act, 2009

- Notified and implemented on 4th August 2009 in all states except U. P.
- The ground situation – No headway in implementation even after 11 years
- Section 3: Basic compliance of the provisions of notifying the veterinarians, veterinary officers, their jurisdiction, competent authorities to issue notifications have not been done and publicized.
- **Section 4** of the Act which deals with the disease reporting process is only on paper – **too tedious and impossible to implement**
- Village Officer → Veterinarian → Veterinary Officer → Competent Authorities
- **Section 5:** Segregation by the farmers
- **Section 6(4):** Ensure availability of vaccine when a disease outbreak is reported
- **Section 8-9-** Provision of issuing of vaccination certificate and traceability have also not been complied.
- **Section 25:** Euthanasia to infected animals
- **Scheduled disease:** Exhaustive list of diseases in the schedule – 84 diseases -

Disease Reporting System in India-Total Disarray

- NADRES- Web Platform
- The earlier version included even AI, treatment, Phone call based
- We are not transparent society - Don't keep records
- Reporting a disease in government set up is like inviting trouble
- Diagnostic facilities – only for the sake of doing
- Animosity between Government and Private

Brucellosis Control Program of GoI

- It has been there since more than 10 years
- From 2019- plan is to implement pan-India
- Vaccination of female calves between the age 4-8 weeks
- Once in lifetime vaccination
- Tagging for identification and then vaccination
- Limitations of the control program?
  - Male calves and female adults not included – integrate with calf castration
  - Adult females not included – What to do with positive animals not considered

- Who will inform about a calf 4-8 months
- Who will identify age? How?

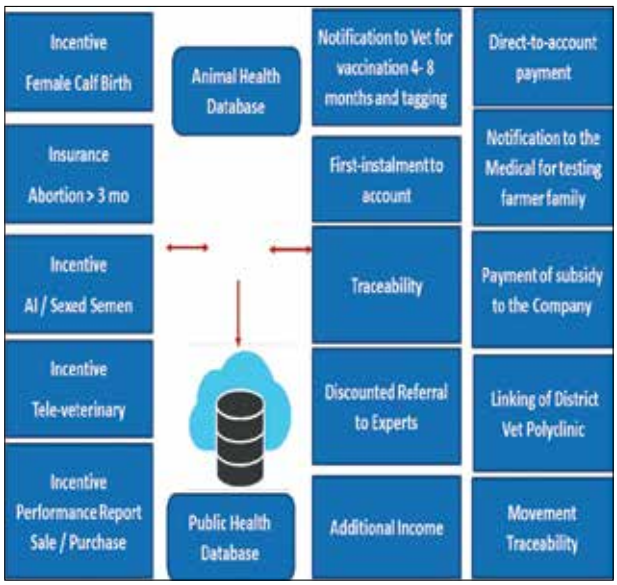
- Traceability – How to differentiate between vaccinated and unvaccinated, dislocated due to sales

One-Health and Brucellosis Control

- Chitale Dairy Bhilvadi Sangli:
- Established One Health Diagnostic Laboratory
- Brucellosis testing is done in all the animals every year – Sandwich ELISA- Positive samples repeated after 21 days
- Veterinary service providers / workers and participating farmers' annual health check **up – Laboratory is used for diagnostic purpose**
- All cases of abortions reported and investigated – 14-21 days post-abortion
- In-contact farmers and workers informed and asked to see their doctor

Is there a solution?

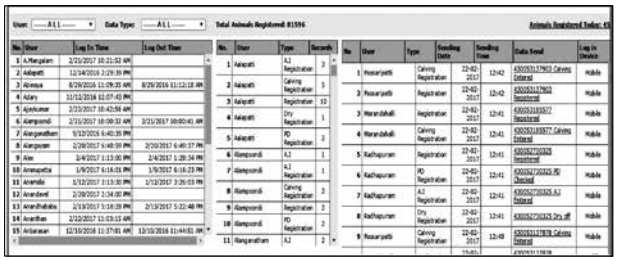
- Human behaviour is important constraint to understand
- Tangible benefits – disease prevention is not an attractive benefit
- At the operative level the programs should be integrated – should not appear to be an additional work and additional reporting
- Incentive-Based Cascade Strategy
- Heavily rely on premises registration, animal identification and traceability, dynamic data capture and incentives to reporting – Part of a larger program

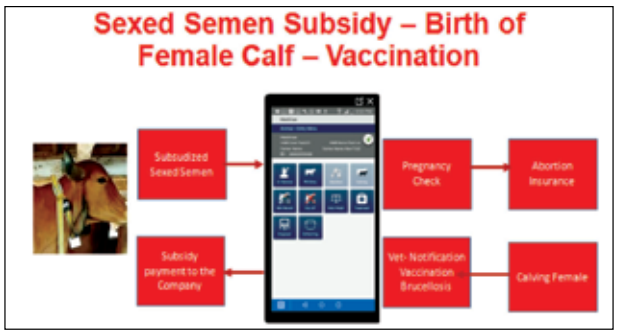


- Partnering is the key: They should see clear benefits: Private Milk Processors, Insurance companies, Breeding companies
- For example the target should be controlling 'Abortion' of all causes
- Disease reporting is an internalized process
- All participants should get perceptible incentives

Dash Board to Monitor Services

- Efficient veterinary service delivery away from curative to preventive
- Dash Board to monitor data traffic and service delivery – LN2 / Container and Semen Supply Management
- Data access to milk collection centre for preventing irregularities and antibiotic residues





Life Insurance corporation of India Health Insurance Department Western Zone, Mumbai

Why Health Insurance?

Treatment Cost for Major Ailment – An example

- Male, age 47 years diagnosed with Myocardial Infarction:
- Total cost of the treatment is approximately Rs. 5 to 7 lakhs
- Treatment Costs going up…

Similar Treatment will cost nearly Rs. 10 to 15 lakhs in next 5-6 years

All financial planning will become meaningless..

Unless the Person has Health Insurance!!

Otherwise,

Future Provision for Child Education, marriage or retirement gets used-up in a single episode of Hospitalization…

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Factors driving demand for Health Insurance

- Average Longevity increased from 57.2 years in 1990 to 67 years in 2017 among males and from 60.3 years to 72 years in female. i.e. Increased life span (Institute of health metrics & Evaluation)
- Longer Life means more prone to Age related & Life style related disabilities /diseases.
- '*Indians now live longer, but in Poor Health*'- Global burden of disease study.
- The number of people with Diabetes increased from 2.6 Crs in 1990 to 6.5 Crs in 2016 and this is going to be doubled by 2025. Similarly the number of Cardiovascular disease cases increased from 2.57 Crs in 1990 to 5.45 Crs in 2016. (India council for medical research)
- Disintegration of Joint Families & Lack of any Govt/ Integrated Health Management system – No support to meet sudden expenses
- 80% of Health care expense funded, out of pocket, by people in India.
- Rising Medical Inflation (about 15%) which is higher than the normal inflation

Growing demand

- Health Insurance is the fastest growing segment in India
- Compound Annual Growth Rate (CAGR) of 20 % during the past three years (IRDAI)
- Health sector has garnered Rs. 45489 Crores of Premium (GI council) during the FY 2018-19 as against Rs. 37029 crores in FY 2017-18 (IRDAI).Life

Insurers collected Rs. 271 Crs. (LIC- Rs.99 Crs.) in FY 2018-19 as against Rs. 216 Crs. In FY 2017-18 (LIC Rs.84 Crs). (Life Council).

LIC's Jeevan Arogya Plan

- It is a Comprehensive Health Plan
- Provides Coverage for Principal Insured + Spouse + Dependent Children + Parents + Parents-in-law
- Long term Health cover up to Age 80 years
- Up to Age 25 years for Dependent Children
- Fixed Benefit Plan – Claim amount paid in addition to benefits in any existing Health plan & Claim amount is paid directly to the customer.

Auto Escalation in Benefits

Applicable Daily Benefit (ADB)
= IDB + Annual Increase @ 5% + No claim Benefit

• All Benefits are multiples of ADB, hence, Benefits increase with increase in ADB

Hospital Cash Benefit (HCB)

•Payable for Hospitalization due to Accidental Bodily Injury or Sickness

•Initial Daily Benefit (IDB) @ Rs. 1000, Rs. 2000, Rs. 3000 & Rs. 4000 to be chosen by Policyholder

•Minimum IDB Rs. 1000 & Maximum IDB Rs. 4000;

•Spouse to have IDB less than or equal to that of PI ; Others to have less than or equal to that of Spouse/PI

Jeevan Arogya – Age limits*

Insured Member	Minimum Age at entry	Maximum Age at entry	Maximum Cover ceasing Age
PI	18 y	65 y	80 y
Spouse	18 y	65 y	80 y
Parents / Parents-in-law	18 y	75 y	80 y
Dependent Children	3 months (completed)	17 y	25 y

* Age as on last birthday

Auto Escalation in HCB

Illustration	
Year	Daily Benefit
1 - IDB	4000 (level chosen by Insured)
2	4200
3	4400
4	4600
5	4800
6	5000
7	5200
8	5400
9	5600
10	5800
11	6000 (Maximum allowed i.e.1.5 times IDB)

•Auto increase in Initial Daily Benefit (IDB) to take care of Inflation

•Increase by 5% every year even if there is a claim

•Increases upto maximum 1.5 times the Initial Daily Benefit (IDB)

Major Surgical Benefit(MSB)

• 100 TIMES Applicable HCB (ADB)

•140 listed Surgeries covered

•100% MSB per member/per annum; 800% per member during Life Time

• Surgeries classified as:

Cat I - 100% MSB - 15 Surgeries

Cat-II - 60% MSB - 42 Surgeries

Cat III - 40% MSB - 60 Surgeries

Cat IV - 20% MSB - 23 Surgeries

MSB is in addition to eligible HCB

Day Care Procedure Benefit (DCPB)

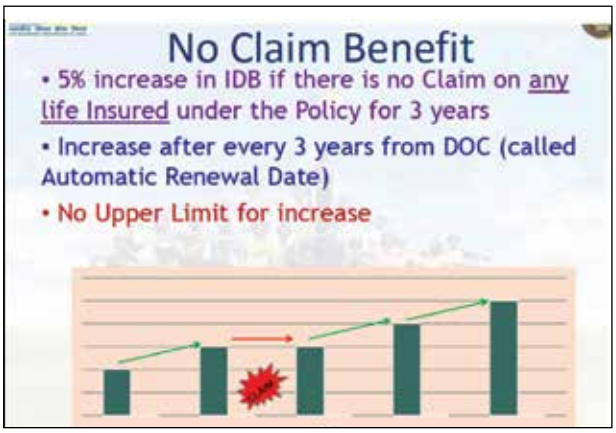
•140 Surgeries, other than the 140 covered under MSB

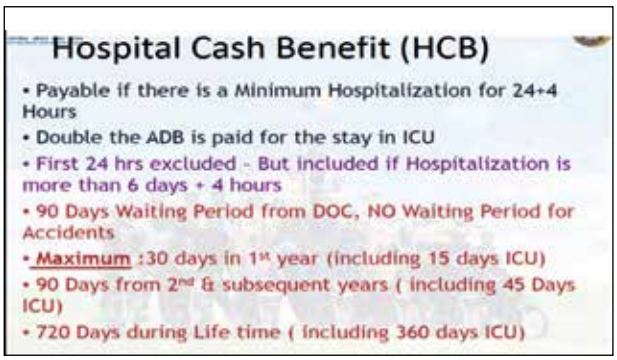
•DCPB payable @ 5 Times ADB in lump sum

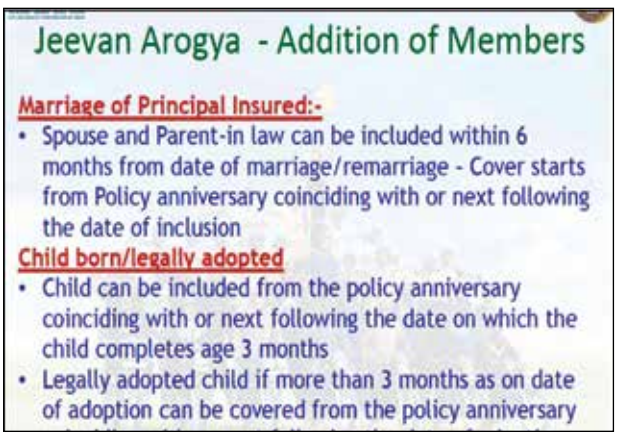
•Can be availed Maximum 3 Times per year per insured member

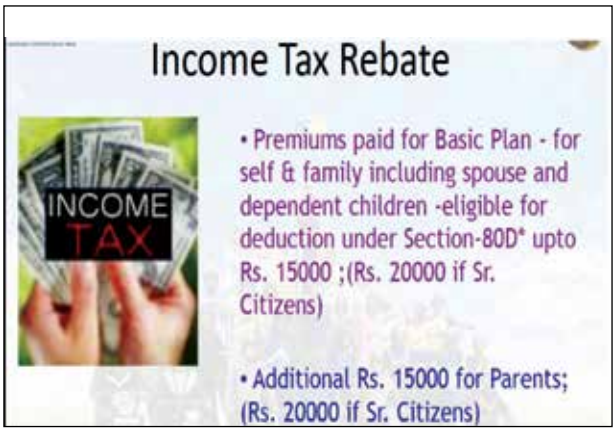
•During Life time, maximum 24 times allowed per insured member

•HCB is not payable in case of DCPB









Jeevan Arogya' as ADD-ON to "Mediclaim

Indemnity Plans

- 'Non-payable' Items as per FICCI-IRDA List - 10-12% of In-patient expenses are not reimbursed.
- Sub-limits such as Cap on room rent to be 1% of SA – Hence, full amount may not be paid
- Reimbursement of eligible costs incurred paid to the hospital.
- Pro-rata reimbursements w.r.t other indemnity policies.

'Jeevan Arogya'

- Covers against deductibles & out of pocket expense
- No sub-limits but defined amount as per Policy Conditions is paid
- Lump sum amount is paid directly to the policy holder irrespective of Costs incurred
- Claim is paid in addition to Claim received under other Health Policies

Jeevan Arogya (904) Claims

DOC : 08.09.2011 P&T : 904/35 MSB-SA : 4 lacs.

Mode : Yly Premium : Rs.22542/- IDB: Rs.4000/-

Dt. of Admission: 07.10.2018 Dt. of Surgery : 12.10.2018

Dt. of Discharge: 31.10.2018 Dt. of intimation: 19.11.2018

Dt. of Settlement: 26.03.2019 Surgery: Renal Transplant (Recipient)

- Claimed Amount : Rs. 1,71,782/-
- Settled Amount : Rs. 6,67,200/- (HCB : Rs.1,87,200 + MSB : Rs.4,80,000)
- Settled more than claimed amount: Rs. 4,95,418/-

DOC: 14.09.2013 P&T: 903/30 MSB-SA: 4 lacs.

Mode : Yly Premium : Rs.13271/- IDB: Rs.4000/-

Dt. of Admission: 25.09.2017 Dt. of Surgery: 26.09.2017

Dt. of Discharge: 03.10.2017 Dt. of intimation: 30.05.2018

Dt. of Settlement: 03.10.2018 Surgery: CABG

- Claimed Amount: Rs. 2,53,437/-
- Settled Amount: Rs. 5,60,000/- (HCB : Rs.60,000 + MSB : Rs.5,00,000)
- Settled more than claimed amount: Rs. 3,06,563/-

Cancer prevalence & Mortalities

- In Third world countries, incidence of Cancer is on the rise. Incidence of Cancer is expected to increase by 100% to 180% in the next 15 years due to increases in life expectancy & increasing proportion of elderly people.
- Cancer is the cause of 12% deaths worldwide and its incidence continues to rise. Each year 12.7 million people discover they have cancer and 7.6 million people die from the disease (59.84%).

There are 100 types of cancers. Cancer is the second common cause of death in India after Cardiovascular diseases

Cancer prevalence – Indian Scenario

As per WHO report in 2018:

- One among 10 Indians is suffering with cancer during their life time.
- Among the cancer effected Indians, there is one death out of 15 cancer effected Indians.
- In India 11.6 lakh new cancer cases reported in 2018. Breast Cancer is predominant in female (1.62 lakh) & Throat Cancer in Male (92,000).
- No of deaths reported due to cancer is 7.85 lakh in 2018.

Cancer Treatment costs in India

- Depending on the Organ affected and the stage, treatment would cost form Rs 2.5 lakh to Rs 20- 30 lakh.
- Cost of diagnostic tests: Tests like CT Scans, PET Scans, MRIs for the Brain, FNAC, Biopsy and other diagnostics come up to almost Rs. 1,00,000/- according to leading corporate hospitals.
- Herceptin: Used for treatment of Gastric Cancer cost Rs. One lakh per injection. One course consists 10 injections.
- Nexaver: Used for treatment of liver/kidney cancer, a course of 120 tablets for one month costs about Rs. 2 lakh.
    - Chemotherapy – cost lies between Rs 30000/- Rs 100000/ (per session). Depending on the stage of cancer, a minimum 6 cycles of chemotherapy is required
    - Radiation Therapy – Cost would be around Rs. 75000 /- to Rs 1, 00,000/- for one round of radiation treatment. Depending on the severity more number of Radiation cycles may be required.
- Hormone Therapy - The cost of quarterly maintenance of hormone therapy ranges from Rs. 16,000 to Rs 30,000 for an injection of Zoladex, Lucrin, Eligard and Pamorelin.
- Treatments involving Bone marrow transplant would cost anything between Rs20 lakh and Rs35 lakh.
- As per American Society of Clinical Oncology(ASCO), immunotherapy would cost more than $1 million per patient per year at the higher dose. This therapy is effective to treat lung, head and neck, kidney, bladder and skin cancers. This is yet to gain grounds in India and keeping in view the exorbitant costs involved, Immunotherapy is still not a viable option for cancer patients in India.

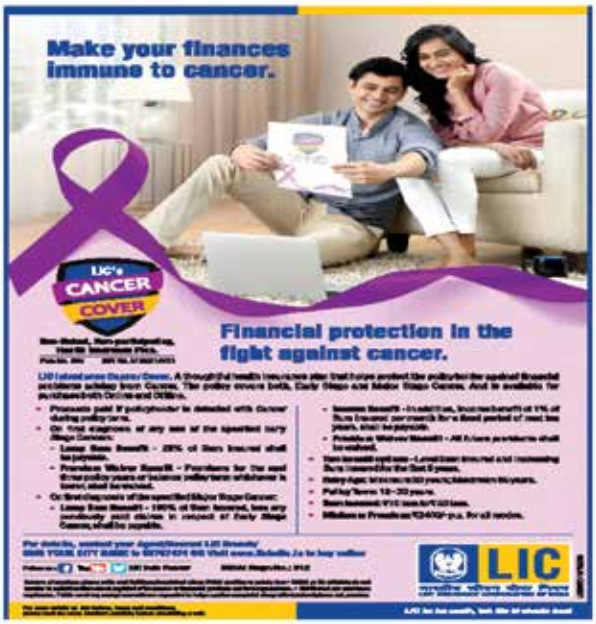
Need for Cancer Cover Insurance

- Diagnosis of cancer often leads to catastrophic personal health expenditures. The non-surgical oncological treatments & surgeries involve very high costs.
- Further, minimum 24 months treatment is required once the advanced stage cancer is diagnosed.
- Cancer care involves expensive maintenance costs even after treatment.
- The prolonged treatment and Recuperation results in loss of monthly income and poses financial burden on families. Such expenditure may push entire families below the poverty line.
- Other types of Health Insurance plans – Indemnity , fixed benefit or Critical Illness policies do not provide for early stage cancers, Premium waiver Benefits and Income Benefits.
- Cancer tumors start around the age of 20. But, detection of cancer is normally around the age of 50 yrs or later. It takes cancer decades to incubate. As such, the incidence may be identified sudden and at an advanced stage. Hence requires proper financial planning to meet the medical expenses.

Hence the need is for specialized plan for Cancer Cover.

Cancer cover policies offer psychological comfort of peace of mind and financial comfort as well

- Half (50%) of people diagnosed with cancer survive their disease for ten years or more provided proper treatment is taken. Financial support during this survival period is required to cover the living and maintenance costs . LIC's Cancer Cover is the only policy in Indian market that provides financial support in the form of Income Benefit for a longer period of 10 yrs.
- With its wide agency network through out the country and broad customer base, LIC has the opportunity to cross sell the Cancer Cover product to its existing customers**.**



Features : LIC's Cancer Cover Plan

- **It Fixed benefit Health Insurance plan.**
- **The policy can be purchased Offline as well as Online.**

(for policy online please log on to www.licindia.com).

Benefit Options

Two benefit options are available which can be chosen by the proposer at the outset & premium rates vary depending on the option chosen

- Option I - **Level Sum Insured--** *The Basic Sum Insured shall remain unchanged throughout the policy term*
- Option II - Increasing Sum Insured *--The Sum Insured increases by 10% of Basic Sum Insured each year for first five years* Or n*until the diagnosis of first event of Cancer, whichever is earlier.*

Age Groups Eligible

Minimum age at entry:20 years (completed)

(b) Maximum age at entry:65 years (last birthday)

(c) Minimum Policy Term:10 years

(d) Maximum Policy Term:30 years

Eligibility

- Minimum Basic Sum Insured: Rs.10,00,000
- Maximum Basic Sum Insured: Rs. 50,00,000

(Subject to an overall limit of Rs.50 lakhs taking all existing Critical Illness Cover policies including Cancer Cover and the new proposal under consideration).

Benefit Structure of Early Stage Cancer

Early Stage Cancer: Provided the policy is in force, on first diagnosis of any one of the Specified Early stage cancers

1. Lump sum Benefit of 25% of applicable Sum Insured is paid (only once for first event)
2. PWB: Premium Waiver Benefit for next three policy years

Benefit Structure of Major Stage Cancer

Major Stage Cancer: Provided the policy is in force, on first diagnosis of any one of the Specified Major stage cancers

1. Lump sum Benefit of 100% of applicable Sum Insured less any claims paid previously
2. PWB - Future Premiums shall be Waived
3. Income Benefit @ 1% applicable sum insured shall be paid monthly for next 10 years to life assured or nominee in case of death of LA.

Waiting Period

- A waiting period of 180 days will apply from the date of issuance of policy or date of revival of risk cover, whichever is later, to the first diagnosis of any stage cancer.

No benefit shall be payable if any stage of Cancer occur before expiry of 180 days from the date of issuance of policy or date of revival and the policy shall terminate

Survival Period

No benefit shall be payable if the Life Assured dies within a period of 7 days from the date of diagnosis of any of the specified Early Stage Cancer or Major Stage Cancer. The 7 days survival period includes the date of diagnosis.

Claims process

Proof satisfactory to the Corporation Within 120 days from the date on which any of the contingencies under Early Stage Cancer or Major Stage Cancer shall be furnished as below:

- Claim Form along with NEFT mandate from the Claimant
- Original Policy document;
- Treating doctor certificate filled by the doctor treating the Life Assured for the diagnosed ailment.
- Hospital certificate/Discharge Summary duly filled by the hospital where Life Assured was admitted.

Cancer Cover (905) Claims

DOC: 06.01.2018 P&T: 905/25 SA: 10 lacs.

Mode: Hly Premium : Rs.5289/- FUP : Jan-2019

Dt. of Diagnosis : 27.07.2018 Dt. of intimation: 07.09.2018

Dt. of Settlement: 19.02.2019 Diagnosis: Adeno Carcinoma of Palate

Treatment details: Excision of Palate DMR Opinion : Early Stage Cancer

Benefits Paid:

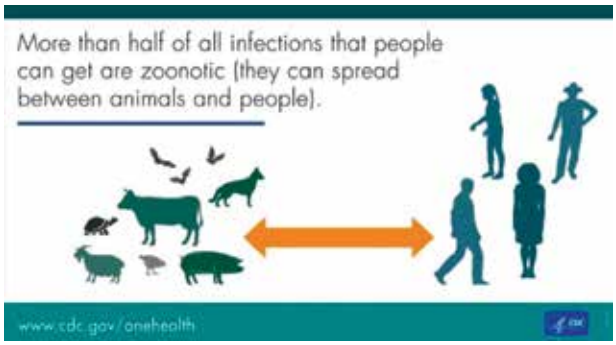
- Early Stage Benefit = Rs.2.50 lacs
- PWB= Rs.0.31 Lacs(Premium Waived for Next 3 Policy Years)

Total Benefits= Rs.2.81 lacs

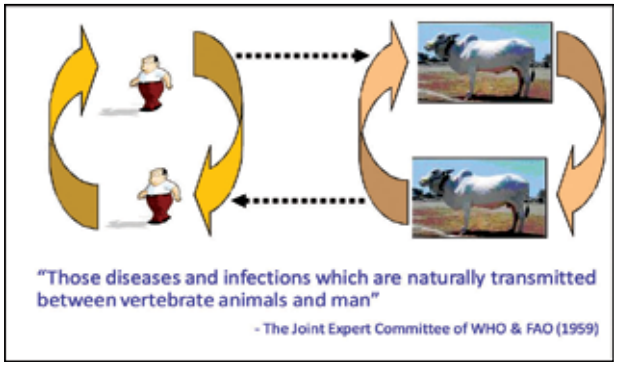
Premium of Rs.10578/- only, remitted as against benefits paid above.

Topic: One Health Approach to Prevent Zoonotic Diseases of Public Health Importance Perspective in Veterinary Sector

Speaker:V.S. Waskar KNP College of Veterinary Science, Shirwal (Maharashtra Animal and Fishery Sciences University)

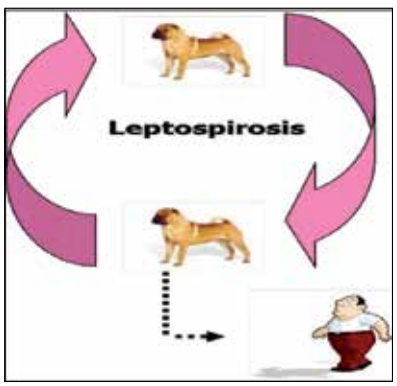


Zoonotic diseases: A serious threat to mankind



Types of zoonoses

Anthrapozoonoses
Zooanthraponoses
Amphixenoses



- ***Zooanthroponoses:***
  - Disease of man pass to other vertebrate.
  - E.g. TB (Human type), Amoebiasis, Diphtheria (Human type)
- ***Amphixenoses:***
  - Ubiquitous disease – man as well as animals acts as host
  - Man to animal & animal to man
  - Infection can persist in human population independent of animals & vice versa
  - E.g. Streptococcosis, non-host specific salmonellosis, Staphylococcosis

Zoonotic disease transmission cycles

- **SYLVATIC CYCLE**

Pathogen is confined and propagates in wild animals →Entry of man/domestic animals in ecosystem → Exposure to infection → Enforcement of sylvatic domestic animal cycle/ sylvatic human cycle

Pathogen is confined and propagates in wild animals →Entry of man/domestic animals in ecosystem → Exposure to infection → Enforcement of sylvatic domestic animal cycle/ sylvatic human cycle

e.g. Kyasanoor forest disease, monkey pox, etc.

- **SYNANTHROPIC CYCLE**

Pathogens are present in domestic animals → Propagation occurs via synanthropic animals (rodents, birds & lizards) →Exposure to man results in zoonotic diseases

e.g. Plague, tularemia, etc.

- **HUMAN CYCLE**

Infection persist in nature in man to man cycle

Infection can also pass from man to animals

e.g. Human TB

Routes of transmission

- Interaction with animals in our daily lives.
- Use of animals for food.
- Keeping them as pets in our homes.
- Close contact with animals at fairs and zoos.
- Contact with wildlife at outdoors or bugs that transmit disease.
- Unethical trade or use of animals/birds.
- **Unwanted interference in ecosystem.**

Emergence of Zoonotic Diseases

Microbial Adaptation

Human Population Pressures

Poverty and Susceptibility to Infection

Economic Development and Land Use

Urbanization

International Travel

Exotic Animal Trade

Bush Meat Consumption

Intent to Cause Harm (Bioterrorism)

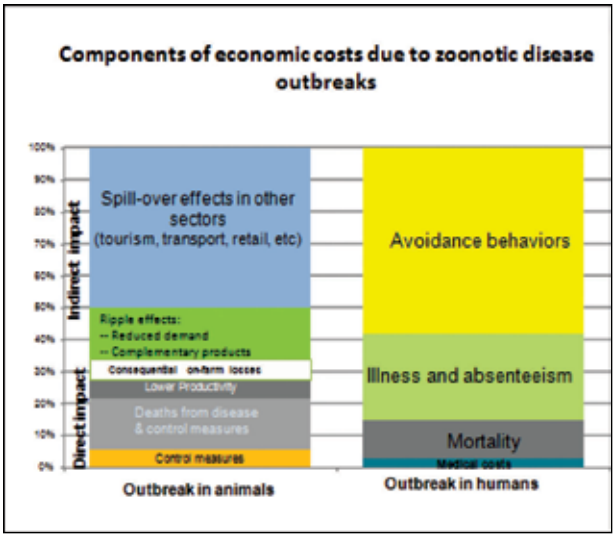
Socio-economic impact of zoonotic diseases

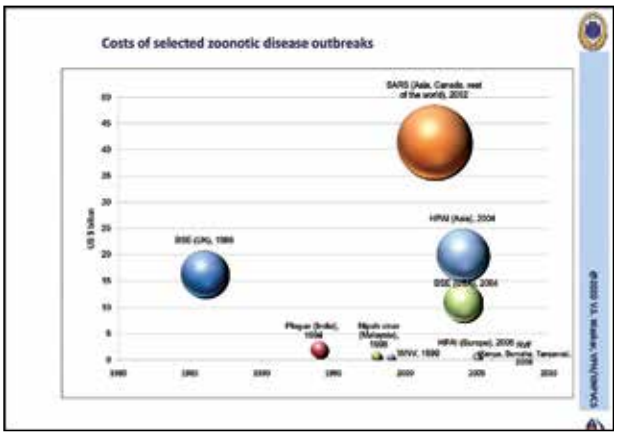
Animals

- Loss of life
- Loss of productivity
- Cost of treatment
- Cost of dignosis, prevention and control
- Wastage of feed ingredients
- Scarcity of animal proteins
- Cost of import/export
- Indirect losses – Tourism, trade loss
- Prevention of animal habitation

Humans

- Loss of life
- Loss of productivity/earning
- Cost of hospitalization/treatment
- Cost of dignosis, prevention and control
- Socio-economic and mental trauma
- Interference with livelihood pattern
- Febrile illness – loss of work efficiency
- Increased disease susceptibility
- Pschyatric/social disturbances





IMPACT ON HUMANS - SELECT ZOONOTIC DISEASES

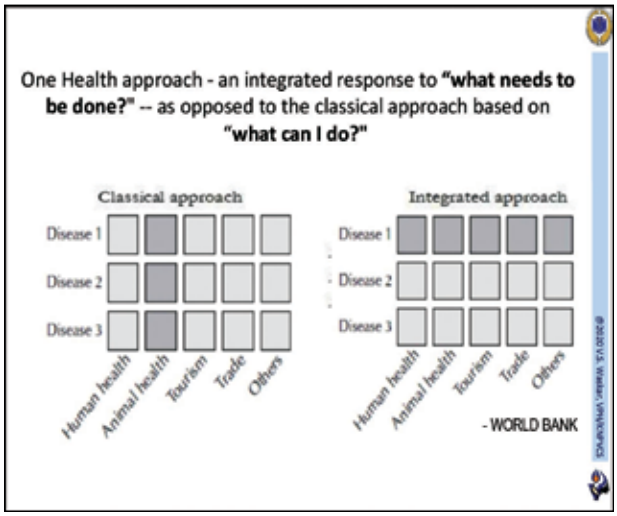
Disease	Period	Reported cases	Reported fatalities
SARS	2002-2003	7,918	761
HPAI	2004-present	12,584	1345
West Nile Fever	1999-2008	28,975	1,124
Rift Valley Fever	2006-2007	1,062	315
Ebola	March 2016	28,646	11,323
COVID-19	31st Dec. 2019-present	83,650 < 4,400	2,858 67

Zoonotic diseases

- Prevention
- Control
- Eradication

Multisectoral approaches

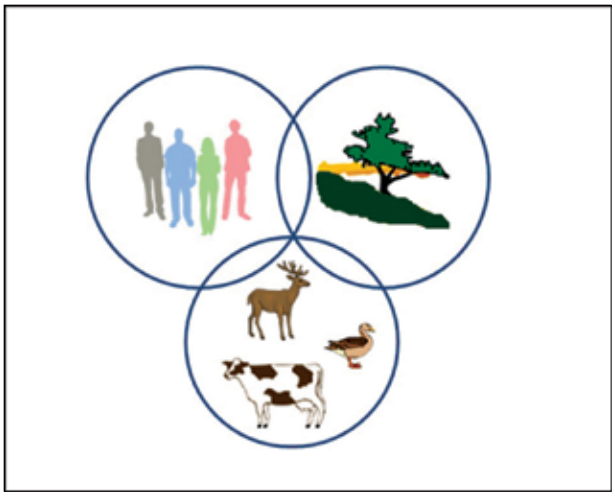
- Early diagnosis
- Mass treatment
- Vector control
- Reservoir control
- Environmental hygiene
- Mass immunization
- Quarantine
- Test and slaughter/segregation
- Resistance building
- Health education



One Health Concept

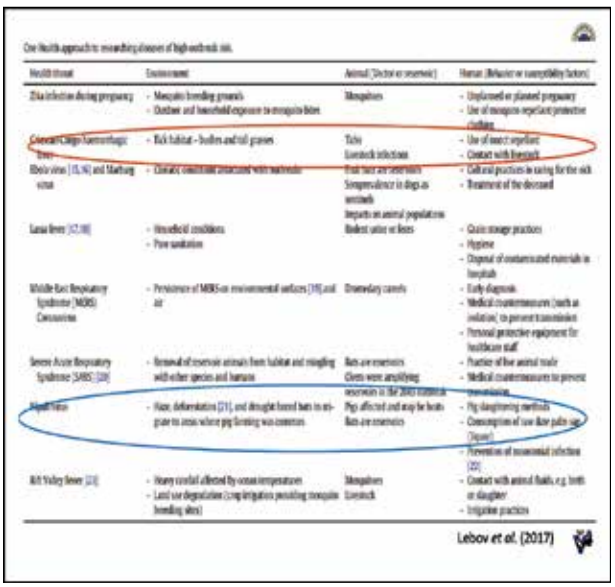
One Health aims at providing holistic prevention and treatment of human and animal diseases, by:

- Taking into consideration the interconnections among humans, animals, their shared environment and associated factors that influence the epidemiology of zoonotic diseases.
- One Health advocates for a multidisciplinary approach to addressing human, animal and ecosystem health issues.
- Unfortunately,
- Multidisciplinary collaboration has some barriers to overcome because of already 'single discipline' established structures.



Rabies: Perfect Example of how One Health is *essential*

- Physicians to vaccinate & provide supportive therapy to victims
- Veterinarians to vaccinate and sterilize stray animals
- Forest authorities to carry out oral vaccination of reservoirs
- Lab personnel to provide rapid and accurate diagnosis
- Sanitarians to eliminate garbage that feeds strays
- Policy makers to provide platform for interaction
- Educators to teach people to vaccinate their pets
- Media to inform about risks, prevention and control measures
- People to act, responsibly and support for the cause



Case Studies Why One Health Is Important?

AN EPIDEMIC EVOLVES

How the Fight Against Ebola Tested a Culture's Traditions

To stop infected bodies from spreading the disease in Sierra Leone, health officials persuaded local leaders to change how villagers mourned.

Kissing the Corpses in Ebola Country

HOT ZONE

Ebola victims are most infectious right after death—which means that West African burial practices, where families touch the bodies, are spreading the disease like wildfire.

Abby Haglage | Updated Apr. 14, 2017 3:07PM ET / Published Aug. 13, 2014 5:55AM ET

MISCONCEPTION→ MISNAMING→ ECONOMIC LOSS

- Outbreak of influenza A (H1N1) in late April 2009 in Mexico
- Widespread illness and loss of lives
- Economic costs for pandemic preparedness
- Disruption of economic activity
- Misnaming of the disease due to genetic similarity
- the name "swine flu" took hold, though the virus was not detected in pigs
- International trade bans
- Restricted the import of pigs and pork products from countries reporting human cases of Influenza A (H1N1).
- Consumers reduced their purchases of pork and prices slid in many markets.
- In a few countries, governments even ordered the culling of pigs, despite the lack of the disease and in disregard of the potential livelihood losses for poor affected farmers.
- Efforts failed to reassure the public that pigs were not the source and that consumption of pork products did not pose risk of exposure to the disease
- Little effect as the name was already well established.
- Hence, blame for this component of the economic losses suffered has been attributed to the **name "swine flu"**

Disease outbreaks where poor coordination and integration between sectors and the impact

Goal-Six Strategies

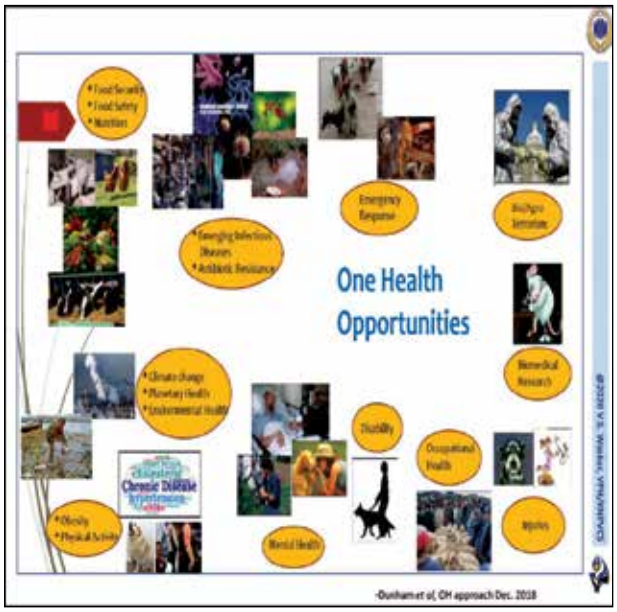
1. More preventive action at the animal-human-ecosystems interface.
2. Building more robust public and animal health systems compliant with the IHR 2005 and OIE international standards, with a shift from short term to long-term intervention
3. Strengthening the national and international emergency response capabilities to prevent and control disease outbreaks.
4. Better addressing the concerns of the poor by shifting focus from developed to developing economies
5. Promoting institutional collaboration across sectors and disciplines

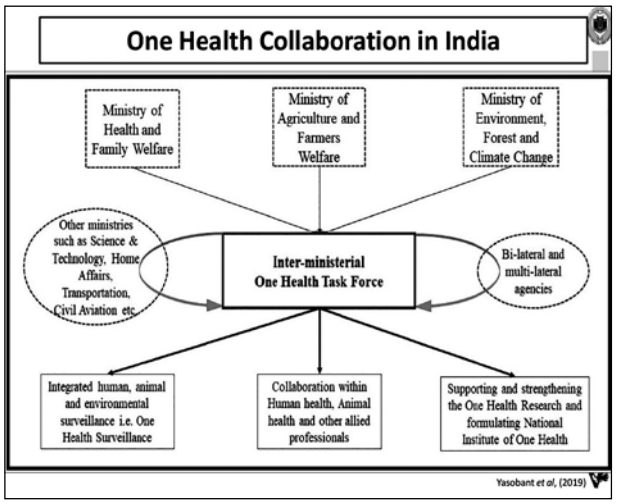
Conducting strategic research to enable targeted disease control programmes.

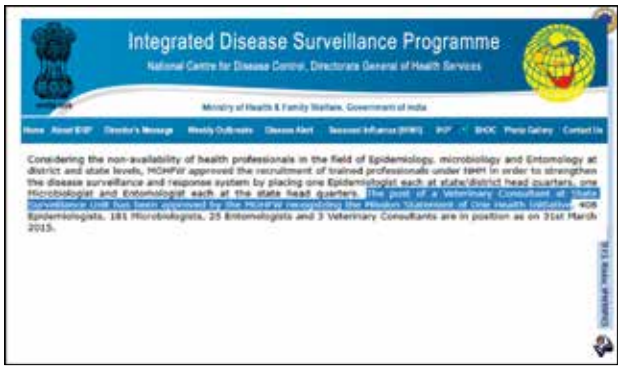
One World, One Health- Manhattan Principles

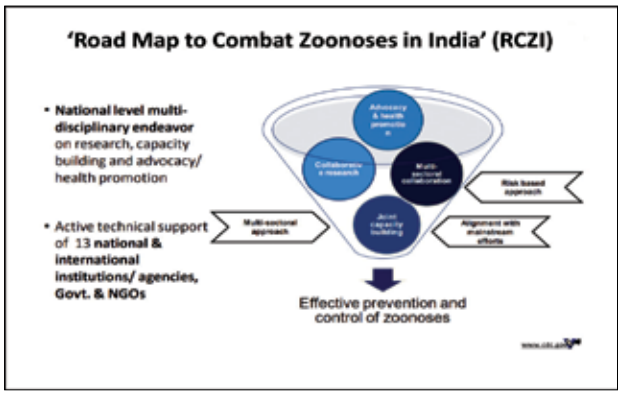
1. Recognize the essential link between human, domestic animal and wildlife health and the threat disease poses
2. Recognize that decisions regarding land and water use have real implications for health
3. Include wildlife health science as an essential component of global disease prevention, surveillance, monitoring, control and mitigation
4. Recognize that public health programs can greatly contribute to conservation efforts
5. Devise adaptive, holistic and forward-looking approaches to the prevention, surveillance, monitoring, control and mitigation of emerging and resurging diseases that take the complex interconnections among species into full account
6. Integrate biodiversity conservation perspectives and human needs when developing solutions to infectious disease threats

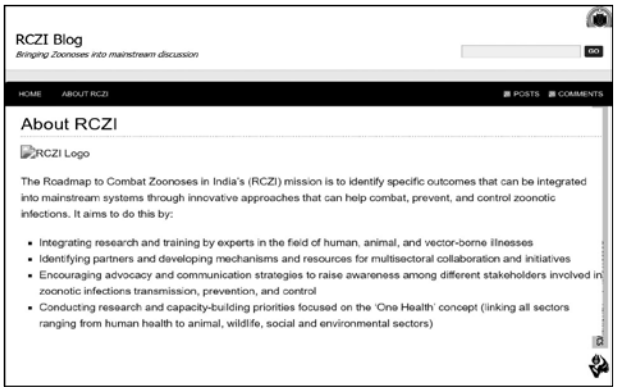
7. Reduce demand for and better regulate the international wildlife and bush meat trade
8. Restrict the mass culling of wildlife species for disease control
9. Increase investment in the global human and animal health infrastructure
10. Form collaborative relationships among governments, local people, and the private and public sectors
11. Provide adequate resources and support for global wildlife health surveillance
12. Invest in educating and raising awareness among the world's people











- *Need of the hour: CONCLUSIONS Close collaboration at local, regional and global levels among veterinary, health and environmental governance.*
- *Strict health surveillance to incorporate domestic animals, livestock and poultry too.*
- *Prioritization of zoonotic diseases in wake of climatic variations, different animal-human and vector densities.*
- *Early detection at animal source can prevent disease transmission to humans and introduction of pathogens into the food chain.*
- Disease surveillance has to go beyond humans and encompass preventive health and hygiene in livestock and poultry, improved standards of animal husbandry for greater food safety, and effective communication protocols between animal and public health systems.

Topic: One Health Approach to Prevent Zoonotic Diseases of Public Health Importance - "Perspective in Medical Sector"

Speaker: Dr. Sunil Kuyare, Dr. Gita Nataraj Department of Microbiology Seth GS Medical College and KEM Hospital, Mumbai

Introduction

- 25% of the 57 million annual deaths globally are caused by microbes.(WHO)
- 1415 species of infectious organisms pathogenic to humans- Zoonosis constitute 61%.
- 175 infectious emerging species- 75% are zoonotic.
- Medical curriculum focuses more on human health

Asokan GV, Asokan V, Fedorowicz Z, Tharyan P. Use of a systems approach and evidence-based One Health for zoonoses research. Journal of evidence-based medicine. 2011 May;4(2):62-5.

Zoonotic diseases of public health importance

- Rabies
- *Salmonella* infection
- West Nile virus infection
- Q Fever (Coxiella burnetii)
- Anthrax
- Brucellosis
- Lyme disease
- Ringworm
- Ebola
- Zika virus
- Coronaviruses
- And many more……

What Is The 2019 Novel Coronavirus?

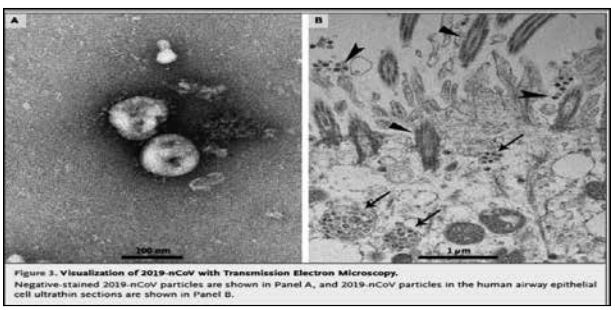


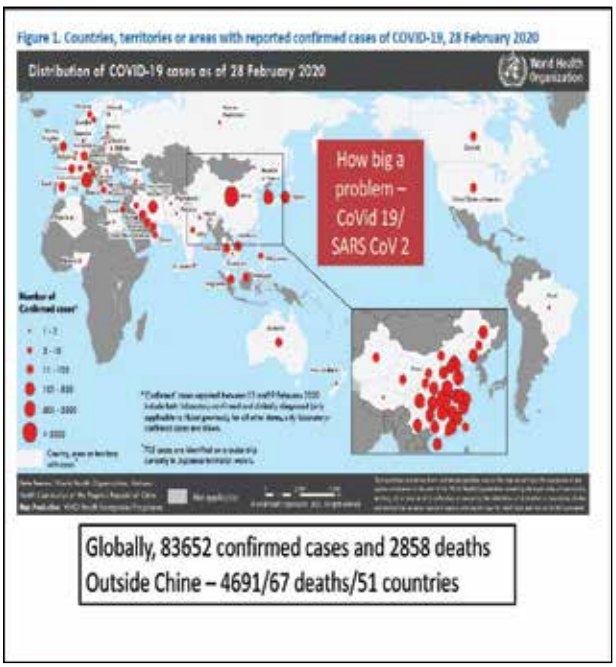
Figure 3. Visualization of 2019-nCoV with Transmission Electron Microscopy.
Negative-stained 2019-nCoV particles are shown in Panel A, and 2019-nCoV particles in the human airway epithelial cell ultrathin sections are shown in Panel B.

What Is COVID-19?

- In December 2019, China notified WHO of cluster of patients with unexplained pneumonia linked to seafood wet wholesale market in Wuhan
- Virus was detected and isolated from bronchoalveolar lavage specimens identified by transmission electron microscopy, cytopathic effects on human airway epithelial cell cultures, whole genome unbiased sequencing (NGS)
- Presumed zoonotic in origin (bats?, ?snakes, ?prawns)

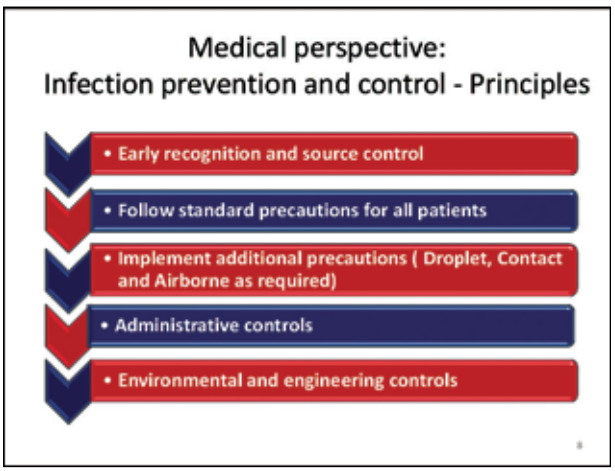
Bbc.co.uk

Bbc.co.uk



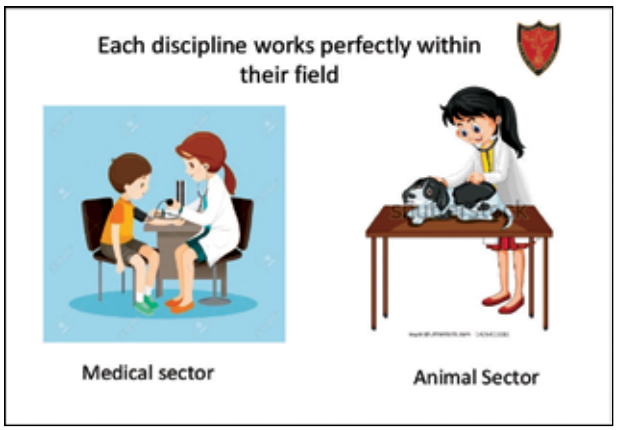
Should We Be Concerned?

- WHO Risk Assessment at SEARO level: Very High (28/02/2020)
- Three confirmed cases reported from India (Kerala)
- 600+ Indian citizens evacuated from Wuhan
- Person to person transmission occurs by droplets and close contact
  - Transmission has been reported during asymptomatic phase
- India shares land border and close economic and people to people exchange with China, besides extensive exchanges with other affected nations
- 600,000 Indians visited China and 250,000 Chinese visited India (2018) (MEA, GoI)
- Bilateral trade between China and India: US$ 89.6 billion in 2017-18 (MEA, GoI)



Infection Control Measures

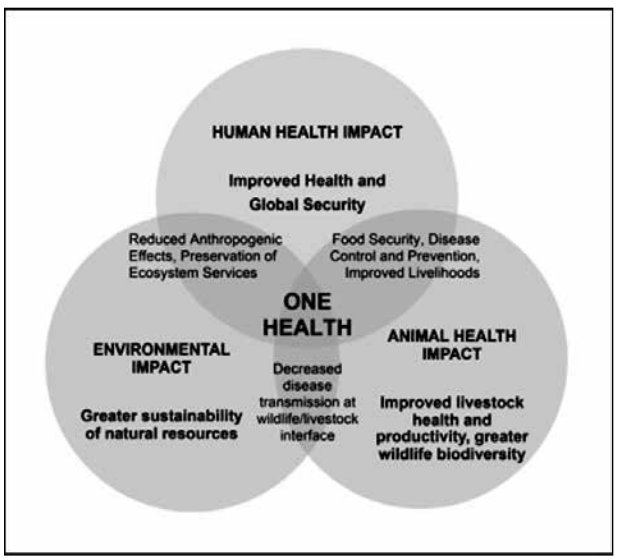
- High level of awareness and alertness in HCWs
- Screening questionnaire
- See patients in areas with natural ventilation
- Post signages (Registration area, Casualty, OPDs, Wards)
- Provide patients with a Face Mask (medical / procedure) as soon as they arrive
- Implement, promote and monitor Cough Etiquette / Respiratory hygiene
- Promote and monitor Hand Hygiene
- **Environmental hygiene** - Thorough cleaning of environmental surfaces with water and detergent and applying commonly used hospital level disinfectants (such as sodium hypochlorite) is effective and sufficient.



What is One Health?

- Collaborative effort of multiple disciplines working locally, nationally, and globally to attain optimal health for people, animals, and the environment.

American Veterinary Medical Association One health



Okello AL, Bardosh K, Smith J, Welburn SC. One health: past successes and future challenges in three African contexts. PLoS neglected tropical diseases. 2014 May;8(5).

Concerns of medial sector for One Health programme

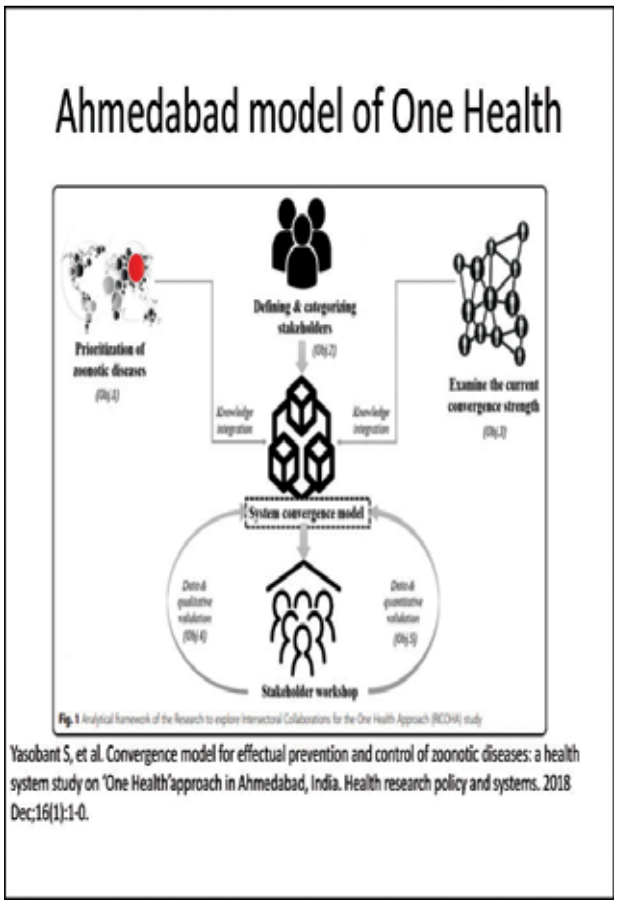
- Human health is the priority
- Ignoring animal health
  - Impact on economic development and food
- Lack of joint assessment of risks, cost and benefits amongst different sectors
- Overemphasis of biomedical research over public health research

- Poor awareness about One Health
- Lack of understanding about expectations from One Health
- Absence of specific guidance frameworks or country-level case studies

Kakkar M, Abbas SS, Hossain SS. One Health: a perspective from the human health sector. Rev Sci Tech. 2014 Aug 1;33:407-12.

One Health- The way forward

- Encouraging bipartite or tripartite collaborations
- Development of common metrics (Risk, cost and benefit)
- Conducting self assessments of One Health programmes for different diseases
- Each discipline should incorporate One Health in their discipline
- Clearly identify areas of joint action
- Transdisciplinary culture among the research, academic and practitioner communities across sectors

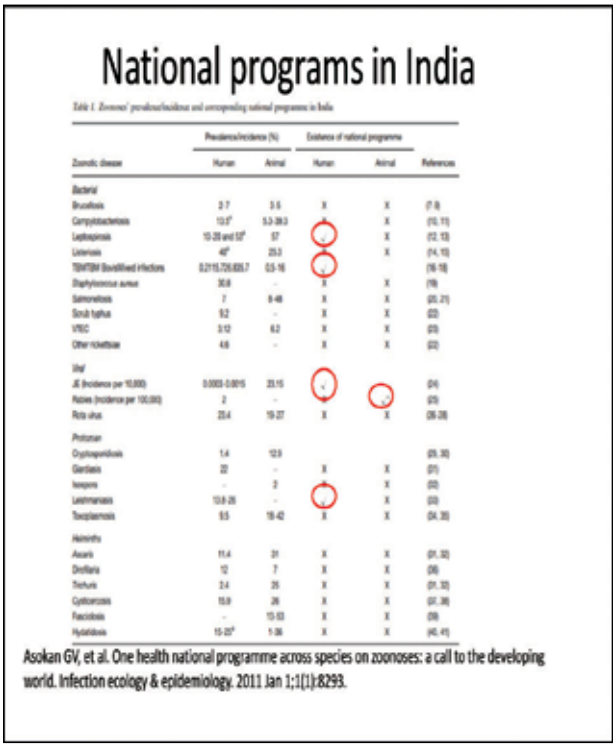


Yasobant S, et al. Convergence model for effectual prevention and control of zoonotic diseases: a health system study on 'One Health'approach in Ahmedabad, India. Health research policy and systems. 2018 Dec;16(1):1-0.

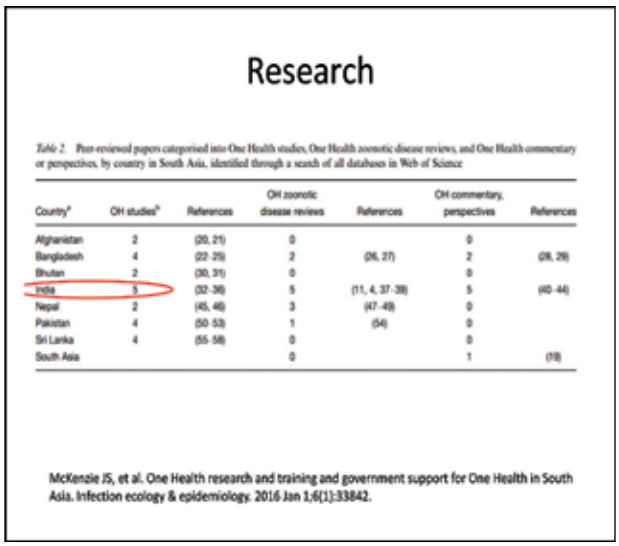
Coronaviruses and One Health concept- Medical perspective

- Global awareness about preventive measures
- Regular surveillance
  - Infected patients
  - Relatives of close contacts
- Use of personal protective equipment while handling live stock

McKenzie JS, et al. One Health research and training and government support for One Health in South Asia. Infection ecology & epidemiology. 2016 Jan 1;6(1):33842.



Asokan GV, et al. One health national programme across species on zoonoses: a call to the developing world. Infection ecology & epidemiology. 2011 Jan 1;1(1):8293.

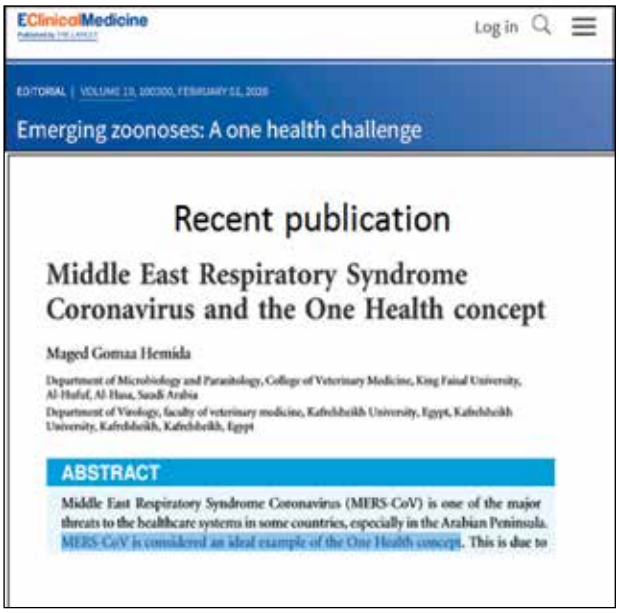


Research

Table 2. Peer-reviewed papers categorised into One Health studies, One Health zoonotic disease reviews, and One Health commentary or perspectives, by country in South Asia, identified through a search of all databases in Web of Science

Country[a]	OH studies[b]	References	OH zoonotic disease reviews	References	OH commentary, perspectives	References
Afghanistan	2	(20, 21)	0		0	
Bangladesh	4	(22-25)	2	(26, 27)	2	(28, 29)
Bhutan	2	(30, 31)	0		0	
India	5	(32-36)	5	(11, 4, 37-39)	5	(40-44)
Nepal	2	(45, 46)	3	(47-49)	0	
Pakistan	4	(50-53)	1	(54)	0	
Sri Lanka	4	(55-58)	0		0	
South Asia			0		1	(19)

McKenzie JS, et al. One Health research and training and government support for One Health in South Asia. Infection ecology & epidemiology. 2016 Jan 1;6(1):33842.



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EDITORIAL | VOLUME 19, 100300, FEBRUARY 01, 2020

Emerging zoonoses: A one health challenge

Recent publication

Middle East Respiratory Syndrome Coronavirus and the One Health concept

Maged Gomaa Hemida

Department of Microbiology and Parasitology, College of Veterinary Medicine, King Faisal University, Al-Hufuf, Al-Hasa, Saudi Arabia

Department of Virology, faculty of veterinary medicine, Kafrelsheikh University, Egypt, Kafrelsheikh University, Kafrelsheikh, Kafrelsheikh, Egypt

ABSTRACT

Middle East Respiratory Syndrome Coronavirus (MERS-CoV) is one of the major threats to the healthcare systems in some countries, especially in the Arabian Peninsula. MERS-CoV is considered an ideal example of the One Health concept. This is due to

Collaborations and lacunae

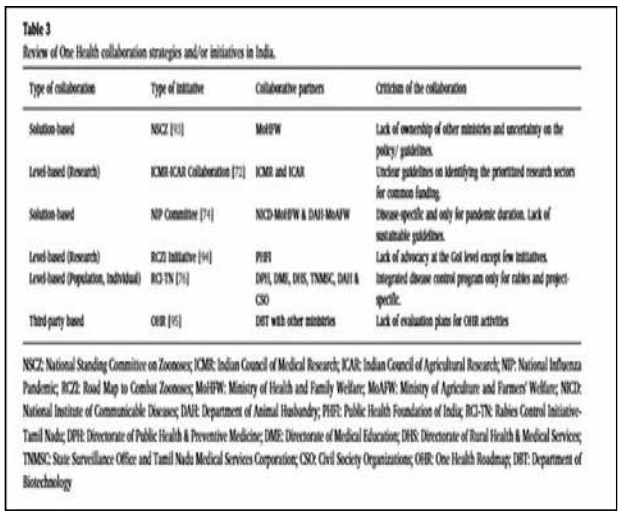

Table 3

Review of One Health collaboration strategies and/or initiatives in India.

Type of collaboration	Type of initiative	Collaborative partners	Criticism of the collaboration
Solution-based	NSCZ [93]	MoHFW	Lack of ownership of other ministries and uncertainty on the policy/ guidelines.
Level-based (Research)	ICMR-ICAR Collaboration [72]	ICMR and ICAR	Unclear guidelines on identifying the prioritized research sectors for common funding.
Solution-based	NIP Committee [74]	NICD-MoHFW & DAH-MoAFW	Disease-specific and only for pandemic duration. Lack of sustainable guidelines.
Level-based (Research)	BCZI Initiative [94]	PHFI	Lack of advocacy at the GoI level except few initiatives.
Level-based (Population, Individual)	RCI-TN [76]	DPH, DME, DHS, TNMSC, DAH & CSO	Integrated disease control program only for rabies and project-specific.
Third-party based	OHR [95]	DBT with other ministries	Lack of evaluation plans for OHR activities

NSCZ: National Standing Committee on Zoonoses; ICMR: Indian Council of Medical Research; ICAR: Indian Council of Agricultural Research; NIP: National Influenza Pandemic; BCZI: Road Map to Combat Zoonoses; MoHFW: Ministry of Health and Family Welfare; MoAFW: Ministry of Agriculture and Farmers' Welfare; NICD: National Institute of Communicable Diseases; DAH: Department of Animal Husbandry; PHFI: Public Health Foundation of India; RCI-TN: Rabies Control Initiative-Tamil Nadu; DPH: Directorate of Public Health & Preventive Medicine; DME: Directorate of Medical Education; DHS: Directorate of Rural Health & Medical Services; TNMSC: State Surveillance Office and Tamil Nadu Medical Services Corporation; CSO: Civil Society Organizations; OHR: One Health Roadmap; DBT: Department of Biotechnology

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EDITORIAL | VOLUME 19, 100300, FEBRUARY 01, 2020

Emerging zoonoses: A one health challenge

- Time to implement One health against zoonosis
- Formal partnership by WHO, the UN Food and Agriculture Organization (FAO) and the World Organisation for Animal Health (OIE)
- principles and best practices to assist countries in achieving sustainable and functional collaboration,Monitoring and surveillance, Introduce one health approach in education and training programme

Topic: Infections and their progression from animal to humans"

Speaker : Dr. Vijay Pratap Kushvaha

Infections And Their Progression From Animals to Humans

Contents of Program:

- Ayurveda definition
- (Definition of HEALTH according to Ayurveda)
- (Definition of DISEASE as per Ayurveda)
- (Disease types according to Ayurveda)
- AagaMtuk vyaaQaI/AagaMtuja: Viruses

Infections And Their Progression From Animals to Humans

Contents of Program:

6. Types of Food:

i. (Havya): Used for Havan

ii. (Bhakshya):

iii. (Bhojya): Veg Food

iv. BaxyaaBaxya (Bhakshyabhaksha): Veg + Non veg

v.(Abhakshya): (Snake), (Scorpio), (Pig),

Infections And Their Progression From Animals to Humans

सर्वेषामेव रोगणां निदानं कुपिता मलाः
तत् प्रकोपस्य तु प्रोक्तं विविधाहित सेवनम्

- अत्यधिक सेवन से वर्जित द्रव्यः पिप्पली क्षार और लवण

- जनपदोध्वंस के कारण **(Reasons for Epidemics)**
- विकृत वायु
- विकृत जल
- विकृत देश

Infections And Their Progression From Animals to Humans

- रोग के प्रकार
- शारिरीक
- मानसिक
- आगंतुक

- आगंतुक: ग्रहों से किसी प्राणि फल्र सब्जी में कण आ जाते है
- किसी प्राणि को खाने से या स्पर्श करने से बिमारी व्यक्तियों में

Infections And Their Progression From Animals to Humans

COURSE OF ACTION:

- हवन
- चिकीत्सा
- मंत्र
- मणि
- औषधी

Infections And Their Progression From Animals to Humans

Some Animal Originated Diseases

- Anthrax
- Arbovirus
- Avian Influenza
- B Virus (Herpes B)
- Bites from Animals
- Brucellosis
- Campylobacteriosis
- Cat Scratch Disease
- Cryptococcosis
- Cyanobacteria (Blue Green Algae)

Infections And Their Progression From Animals to Humans

Some Animal Originated Diseases

- Fish tank granuloma
- Giardiasis
- Hantavirus
- Histoplasmosis
- Importing Animals
- Leptospirosis
- Listeriosis
- Lyme disease

- Lymphocytic Choriomeningitis
- MRSA in Animals

Infections And Their Progression From Animals to Humans

Some Animal Originated Diseases

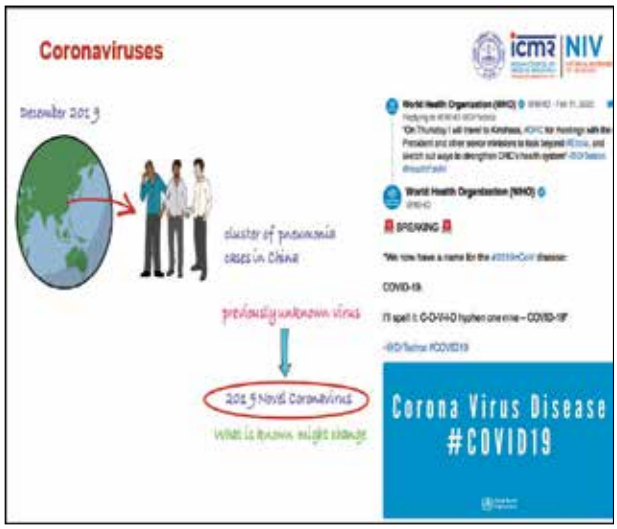
- Petting zoos and Animal Exhibits
- Plague
- Psittacosis (Parrot Fever)
- Rat Bite fever
- Ringworm (Dermatophytosis)
- Roundworm (Toxocariasis)
- Salmonellosis
- Tick-borne Replapsing Fever
- Toxoplasmosis
- Tularemia

Topic: Coronavirus outbreaks in recent decade: Lesson learned

Speaker: Yogesh K. Gurav , Scientist E (Epidemiology Group) ICMR- National Institute of Virology, Pune.

Outline

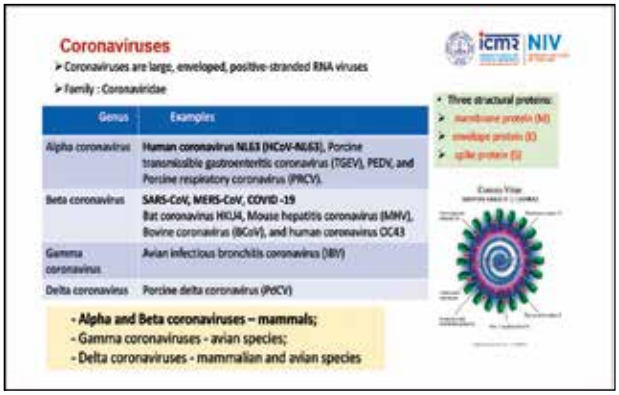
- Coronaviruses, its origin, symptoms, transmission and prevention
- Outbreaks of Coronaviruses (SARS CoV, MERS CoV and COVID-19)
- Ongoing outbreak of COVID-19 (? Pandemic)
- Lesson learned
  - Example of convergence model and One health approach

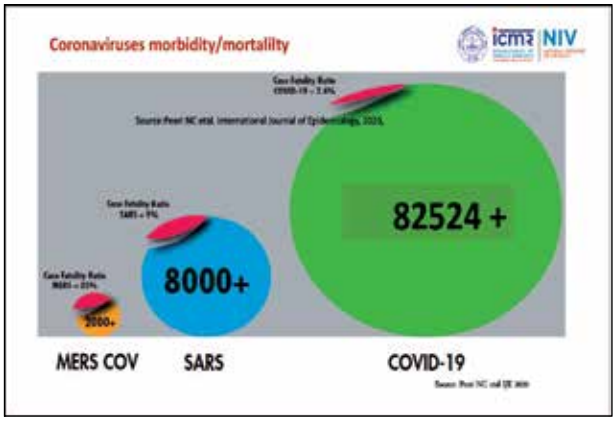


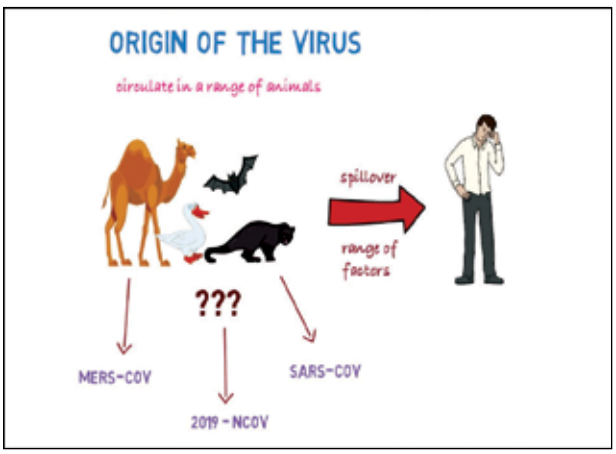
Infections And Their Progression From Animals to Humans

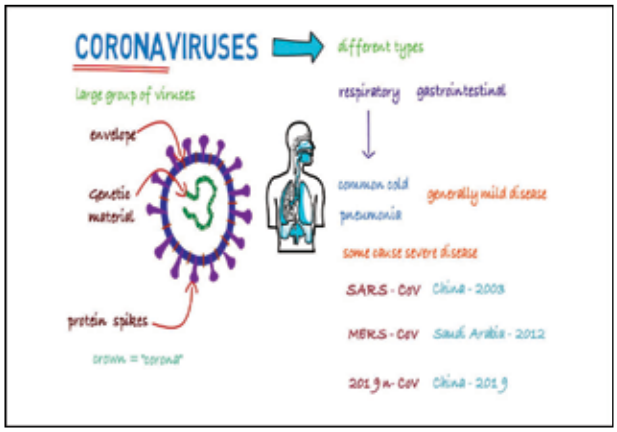
Some Animal Originated Diseases

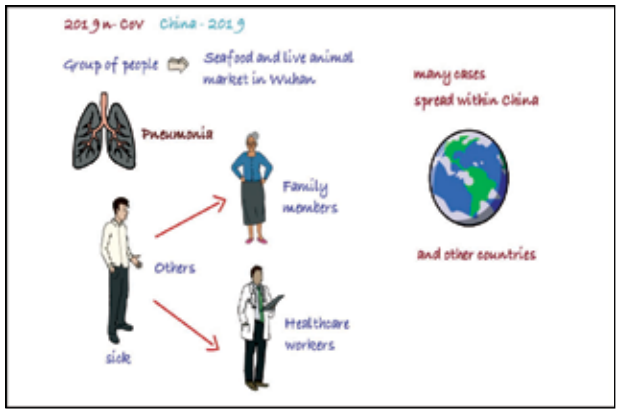
- Valley fever(Coccidioidomycosis)
- West Nile Virus
- Yellow fever
- Zika virus
- Chikunguniya
- E bola
- Dengue
- Malaria
- SARS

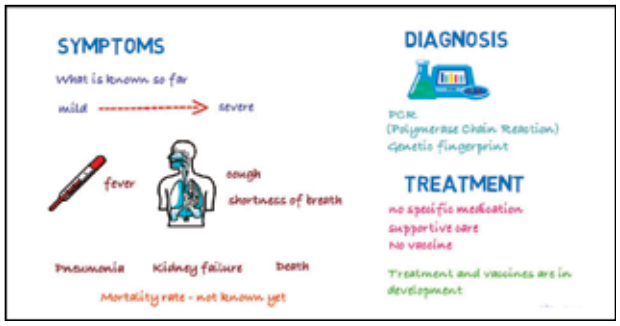


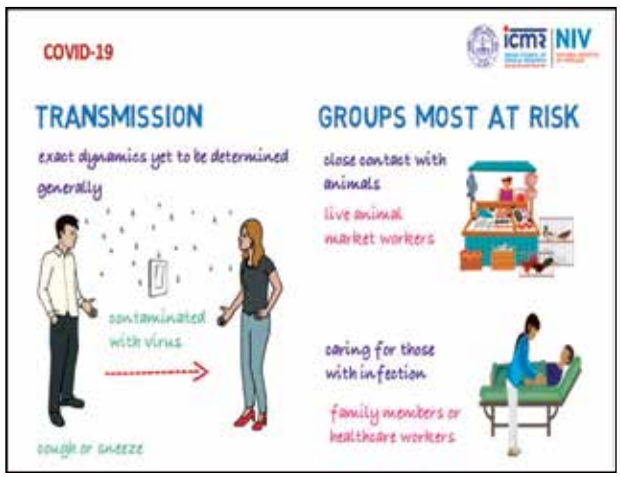


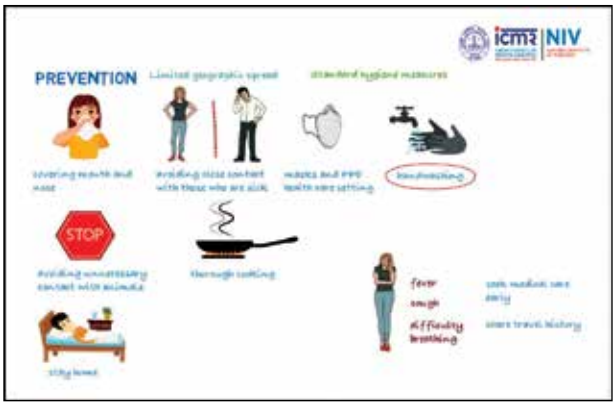






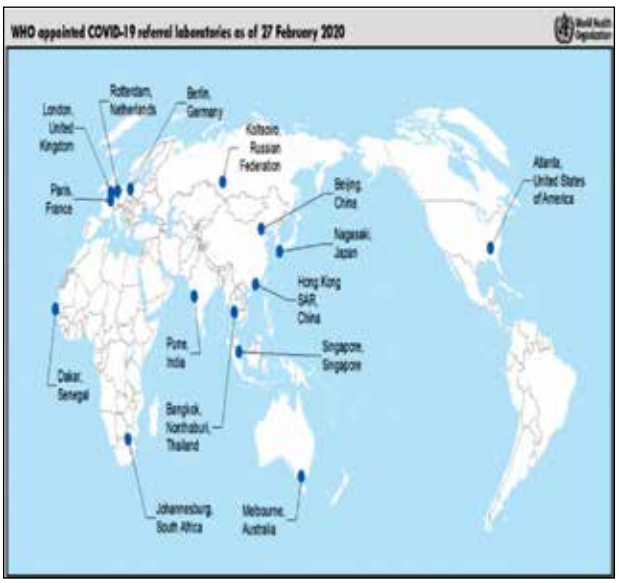






Diagnosis

- The first COVID-19 cases were detected using genomic sequencing, but multiple RT-PCR commercial and non-commercial assays have since been developed.
- WHO has procured a commercial assay and shipped to over 150 laboratories globally.



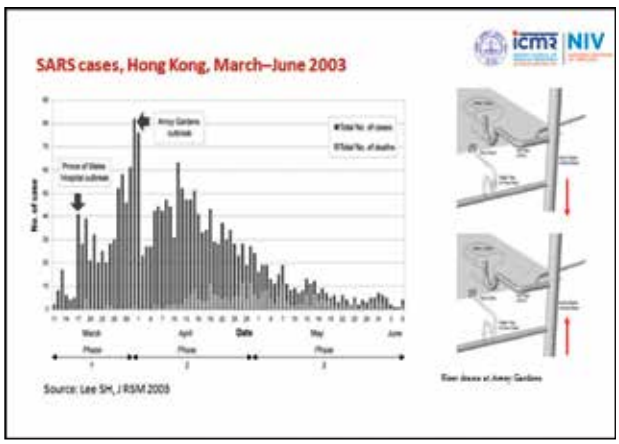
Treatment:

- Clinical trial revealed that a combination of Lopinavir–Ritonavir and in Terferon beta-1b was shown to be effective among MERS cases.
- Broad-spectrum antiviral nucleotide prodrug named Remdesivir presented potent efficacy for the treatment of MERS coronavirus and SARS corona virus.

SARS-CoV

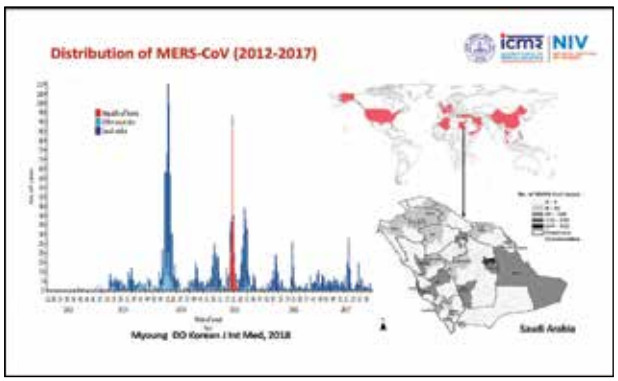
- Guangdong Province in Mainland China had an outbreak of the atypical pneumonia (November 2002) later termed SARS
- Peak in february 2003; up to 5 June 2003, 1511 cases and 57 deaths.
- Later in April 2003, SARS cases reported in other provinces and cities of mainland China including Beijing, Shanxi, Neimonggol, Tianjin and Hebei.
- Up to 5 June 2003, Mainland China had a total of 5329 cases with 336 reported deaths
- The SARS epidemic in Hong Kong has three phases

(I-Teaching hospitals, II-Hospital to community, III- continuing occurrence in 8 hospitals)



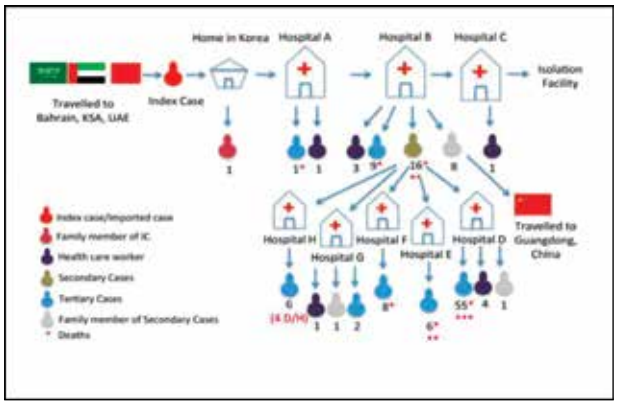
What went wrong during SARS? Lesson learned:

- China kept the disease under wraps leading to social, economic, and humanitarian repercussions
- Not able to make early diagnosis and isolation as a result lot of cross infection that happened in the hospital.
- Lack of protective clothing for medical staff, ill-prepared hospital authorities, staff already working under heavy pressure and put under risk and shortfalls in the healthcare system.
- Management inertia at various levels hampered decision-making & delayed implementation
- SARS also exposed how ill-prepared China and other territories were at responding to pandemics.



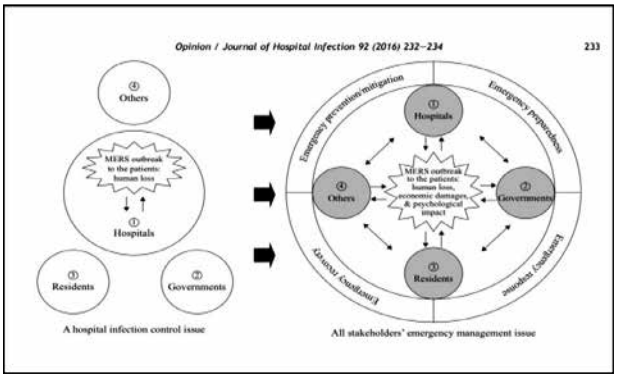
Epidemiologic plot of confirmed cases linked to MERS-CoV outbreak in South Korea, May 20-June 12, 2015

- Index case sought medical attention in different healthcare facilities that failed to diagnose the disease on time.
- Window from the presence of a suspect case in community or healthcare facility to case confirmation play crucial role in disease spread.



Khan et al. J Infect Dev Ctries 2015; 9(6):543-546

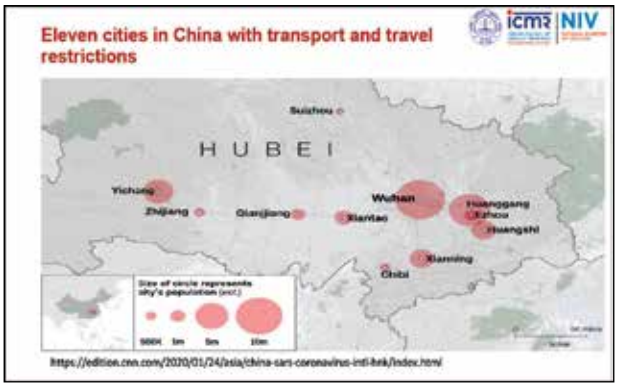
MERS CoV outbreak: The necessity of a paradigm change in the Korean response



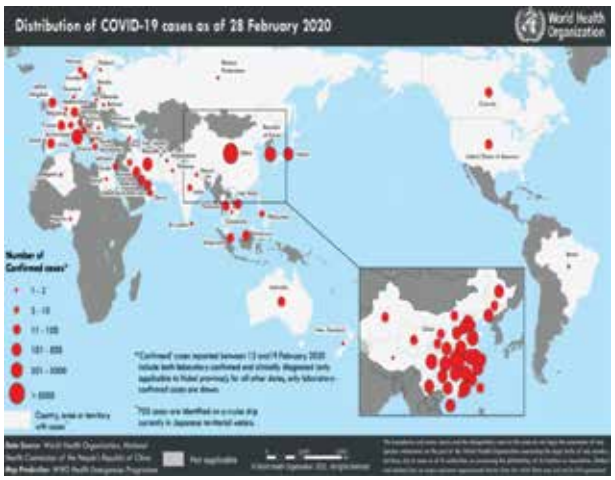
The necessity of a paradigm change in the Korean response

Lessons learned from the 2015 outbreak of MERS-CoV in the Republic of Korea

- A single, missed case may trigger a huge, nationwide outbreak.
- Superspreading events may occur in healthcare settings, especially at the emergency department.
- Patients may transmit MERS-CoV as early as 2 days after symptom onset.
- Early detection and isolation is of critical importance.
- Aggressive strategy for quarantine maybe necessary, especially when large number of individuals are exposed in the healthcare settings.



Global spread of COVID-19



Globally
83 ,652 confirmed (1358 new)

China
78 961 confirmed (331 new)
2791 deaths (44 new)

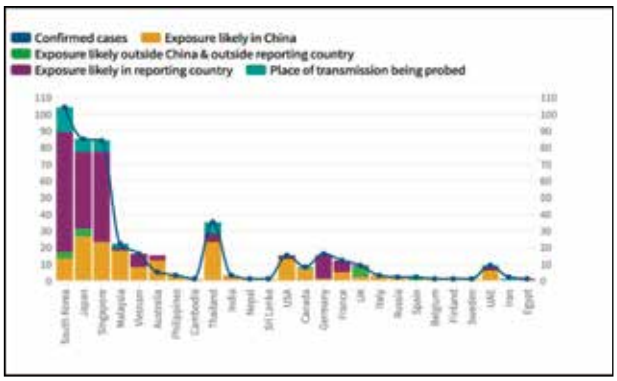
Outside of China
4691 confirmed (1027 new)
51 countries (5 new)
67 deaths (10 new)

WHO RISK ASSESSMENT

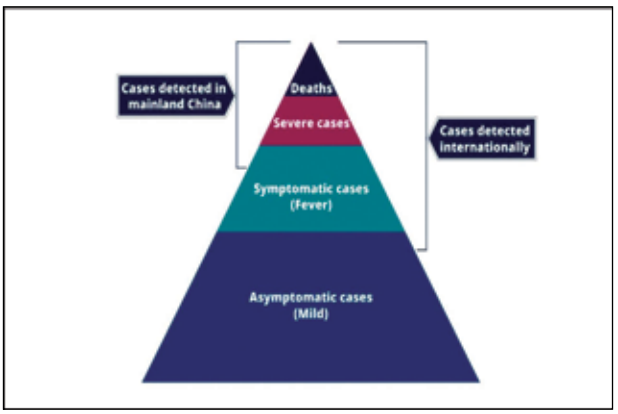
China	Very High
Regional Level	High
Global Level.	High

Source:https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200226-sitrep-37-covid-19.pdf?sfvrsn=6126c0a4_4

Transmission of COVID-19 infection outside China



Clinical spectrum of COVID-19



Epidemiological research needs

- What is the full spectrum of disease severity
- How transmissible is the virus?

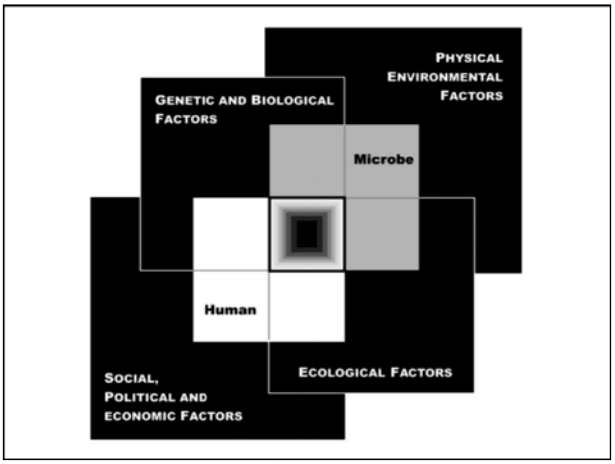
- What are the risk factors for severe illness or death? And how can we identify groups most likely to have poor outcomes so that we can focus prevention and treatment efforts?
- Who are the infectors — how do the infected person's age, the severity of illness, and other characteristics of a case affect the risk of transmitting the infection to others?
- What is the role of asymptomatic infected persons play in transmission?.
- When and for how long is the virus present in respiratory secretions?

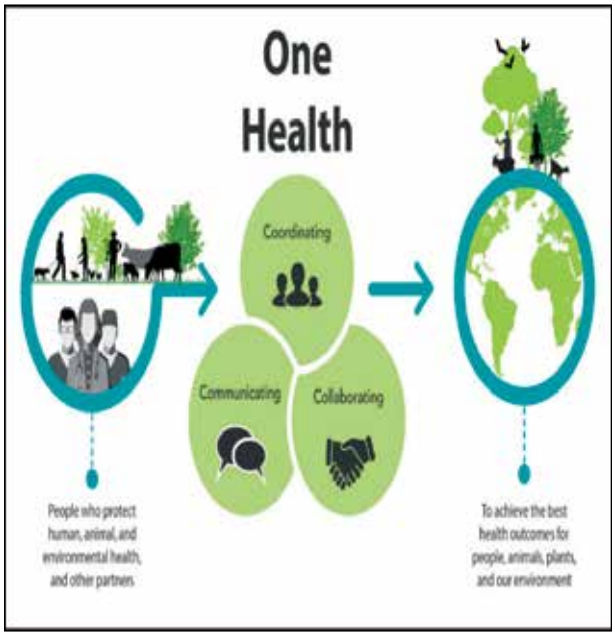
Research needs

Types of Evidence Needed for Controlling an Epidemic.

Evidence Needed	Study Type
No. of cases, including milder ones	Syndromic surveillance plus targeted viral testing
Risk factors and timing of transmission	Household studies
Severity and attack rate	Community studies
Severity "pyramid"	Integration of multiple sources and data types
Risk factors for infection and severe outcomes, including death	Case–control studies
Infectiousness timing and intensity	Viral shedding studies

What we have learned?





What we need to learn

Cooperation of human, animal, an environmental health partners

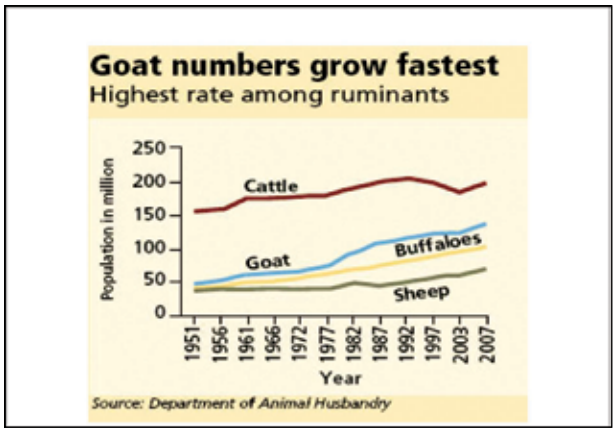
- Human health: Doctors, nurses, public health practitioners, epidemiologists
- Animal health: Veterinarians, agricultural workers
- Environment: Ecologists, wildlife experts
- Others: Law enforcement, policymakers, agriculture, communities, and even pet owners
- No one person, organization, or sector can address issues at the animal-human-environment interface alone

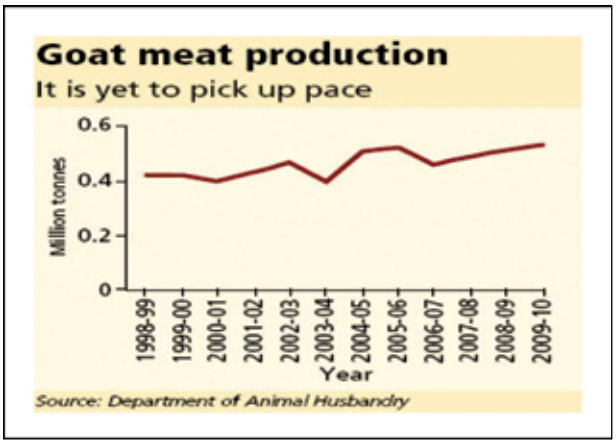
Acknowledgements:

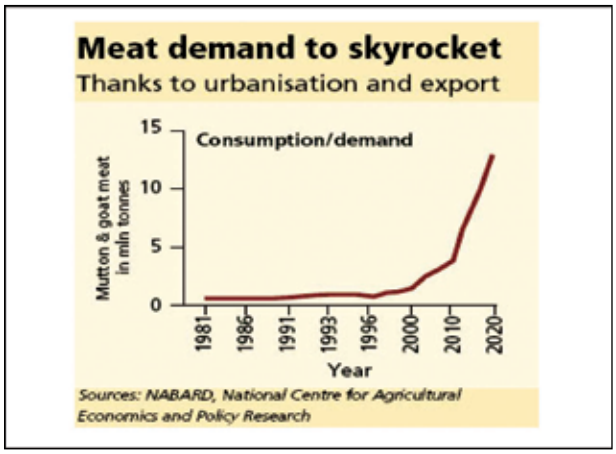
- ICMR-National Institute of Virology, Pune
- Millennium India Education Foundation, New Delhi
- Mumbai Veterinary College, Seth G S Medial College & KEM Hospital, Mumbai

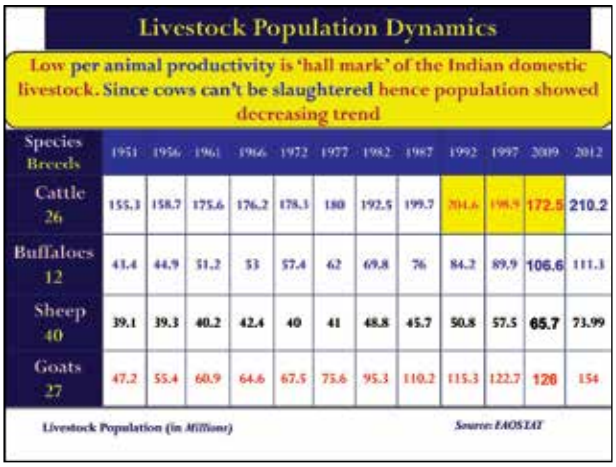
Topic: Bacterial Zoonosis with special reference to Mycobacteriosis: Challenges encountered in Livestock & Poultry

Speaker: Dr. S.V. Singh Prof & Head, Dept. of Biotechnology GLA University, Mathura (U.P.)







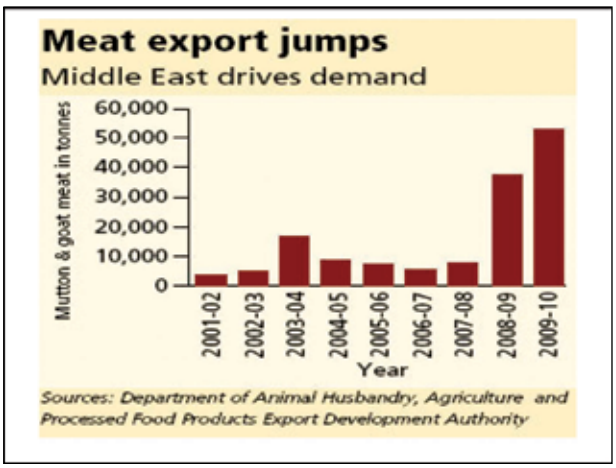


Livestock Population Dynamics

Low per animal productivity is 'hall mark' of the Indian domestic livestock. Since cows can't be slaughtered hence population showed decreasing trend

Species / Breeds	1951	1956	1961	1966	1972	1977	1982	1987	1992	1997	2009	2012
Cattle 26	155.3	158.7	175.6	176.2	178.3	180	192.5	199.7	204.6	198.9	172.5	210.2
Buffaloes 12	43.4	44.9	51.2	53	57.4	62	69.8	76	84.2	89.9	106.6	111.3
Sheep 40	39.1	39.3	40.2	42.4	40	41	48.8	45.7	50.8	57.5	65.7	73.99
Goats 27	47.2	55.4	60.9	64.6	67.5	75.6	95.3	110.2	115.3	122.7	128	154

Livestock Population (in Millions) Source: FAOSTAT



One Health

- More than 6 out of every 10 known infectious diseases in people can be spread from animals,
- 3 out of every 4 new or emerging infectious diseases in people come from animals.

Zoonotic Mycobacteriosis

- **Prioritized disease - globally**
  - **Zoonotic Tuberculosis (*M.bovis,*** *M.caprae, M. africanum and M.tuberculosis-reverse zoonosis*)
- Others with serious concern

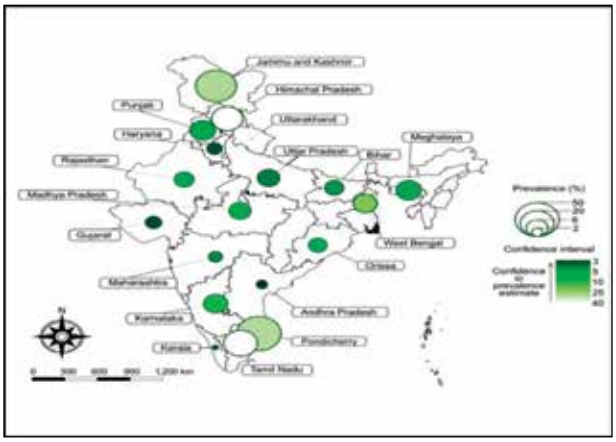
- Paratuberculosis/Johne's disease (*M.avium subsp. paratuberculosis*)
- Avian Tuberculosis (*M.avium subsp. avium*)
- Pig Tuberculosis (*M.avium subsp. hominissuis)*

- Some other non-tubercular mycobacteria (NTM) are also clinically important and have been isolated both from animals and humans

Tuberculosis (Bovine TB in Animals)

- An OIE-listed notifiable disease.
- Bovine TB is a chronic disease of animals caused by members of the *Mycobacterium tuberculosis complex primarily by* ***M. bovis, but also by*** *M. caprae and to a lesser extent M. tuberculosis.*
- *Causing a general state of illness, pneumonia, weight loss, and eventual death.*
- *Economic losses and trade barriers*
- Host of Mycobacteria:
  - ***M.bovis:*** Cattle, and many other domesticated and non-domesticated animals; and human
  - ***M.tuberculosis:*** Humans, cattle and many other domesticated and non-domesticated animals

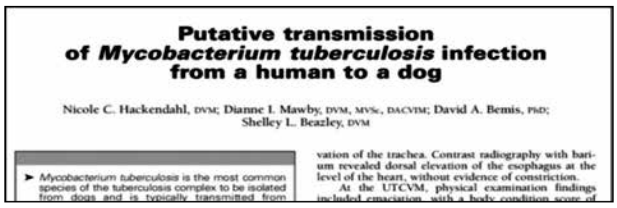
Geographical distribution and pooled prevalence estimates of bovin TB in the different states of India



Zoonotic transmission of *M. Bovis*

- ***Humans are susceptible to*** *M.bovis.*
- *Mode of transmission*
  - Inhalation of aerosol
  - Drinking raw milk from infected cattle
  - Direct contact
- In some countries, ~10% of human tuberculosis is due to Bovine TB.

Reverse Zoonosis: *M.tuberculosis*

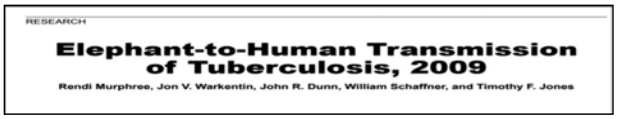


Putative transmission of *Mycobacterium tuberculosis* infection from a human to a dog

Nicole C. Hackendahl, DVM; Dianne I. Mawby, DVM, MVSc., DACVIM; David A. Bemis, PhD; Shelley L. Beazley, DVM

► *Mycobacterium tuberculosis* is the most common species of the tuberculosis complex to be isolated from dogs and is typically transmitted from

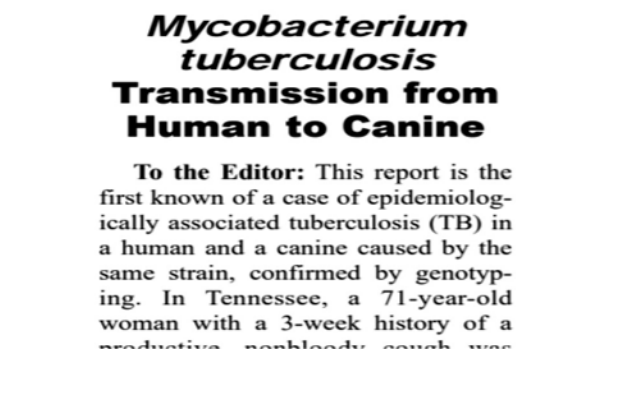
vation of the trachea. Contrast radiography with barium revealed dorsal elevation of the esophagus at the level of the heart, without evidence of constriction. At the UTCVM, physical examination findings included emaciation, with a body condition score of



RESEARCH

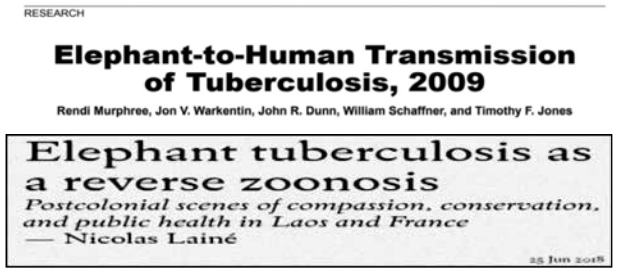
Elephant-to-Human Transmission of Tuberculosis, 2009

Rendi Murphree, Jon V. Warkentin, John R. Dunn, William Schaffner, and Timothy F. Jones



***Mycobacterium tuberculosis* Transmission from Human to Canine**

To the Editor: This report is the first known of a case of epidemiologically associated tuberculosis (TB) in a human and a canine caused by the same strain, confirmed by genotyping. In Tennessee, a 71-year-old woman with a 3-week history of a



RESEARCH

Elephant-to-Human Transmission of Tuberculosis, 2009

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Elephant tuberculosis as a reverse zoonosis

Postcolonial scenes of compassion, conservation, and public health in Laos and France

— Nicolas Lainé

25 Jun 2018

Challenges: Zoonotic TB in Human

- Less awareness or ignorant about the fact that TB does not restrict itself to one host population.
- Under-diagnosis of Zoonotic tuberculosis due to inability of most commonly used TB test to differentiate *M. tuberculosis from M. bovis.*
- Misdiagnosis of Zoonotic TB if involved extrapulmonary sites.
- Difficult to treat the Zoonotic TB as one of key anti-TB drug is known to be in-effective
- Consumption of raw milk
- No routine surveillance of Bovine TB in many of countries including India.
- Vaccination practice is not used as it may interfere with most commonly used diagnosis test (DTH based skin test).
- Test and cull strategy not feasible due to cost, ban of cow culling and lower specificity of diagnostics.
- Wild-life reservoir

Avian/Poultry Tuberculosis

- Avian or Poultry tuberculosis is predominately caused by ***Mycobacterium avium*** subsp. ***avium*** (***M avium***).
- A chronic disease characterized by formation of granulomatous lesions in viscera, a progressive weight loss and death.
- It is usually encountered sporadically in birds reared in small yards, zoos and is a problem among caged exotic birds
- The serovars of human ***M avium*** infection are different from those of the avian species.

The serovars of humans are more closely related to those of swine than those of birds

Species	MAC serotypes	Susceptibility
Domestic fowl (*Gallus domesticus*)	1, 2	High
Turkey	1, 2	Moderate
Pheasants	1, 2	High
Wild birds	2, 3	High
Cattle	1, 2	Moderate
Swine	1, 2, 4, 8	High
Rabbit	1, 2	High
Man	1, 4 to 20; 23, 25	Low (in healthy individuals); High (in immunocompromised)

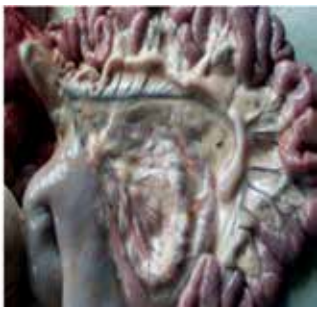
Causal Organism:

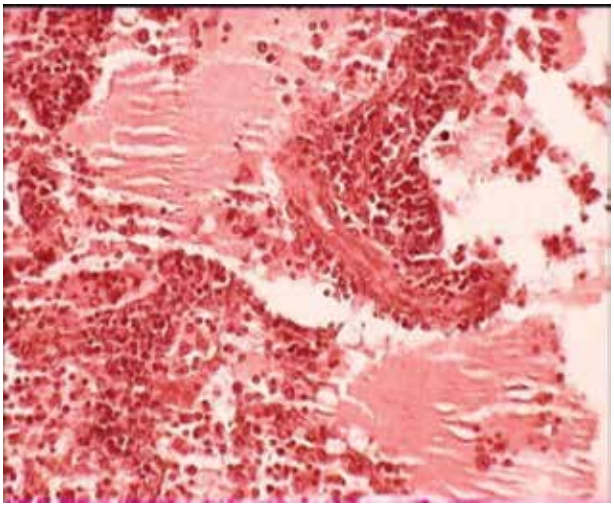
- Chronic infectious granulomatous enteritis of domestic livestock species caused by *Mycobacterium avium paratuberculosis (MAP).*
- Symptoms: Non-specific; loss of weight with or without diarrhea (continuous/ intermittent), reduced milk production etc.
- Transmission: Vertically (semen, pregnancy, colostrum) & Horizontally (fecal to oral route)
- Epidemiology: Disease is endemic in a wide geographical region of country.

Countries	Prevalence (%)
United States	2.6 - 72.0
Europe	0.9 - 71
Australia	14 - 17
New Zealand	60.0
Canada	16.1

Countries	Prevalence (%)
China	11.7
Brazil	2.7
Slovenia	18.2
Iran	20.0 - 32.0
India*	16.2 - 87.8

Clinical Symptoms, Gross and Microscopic Lesions of Johne's disease in goats



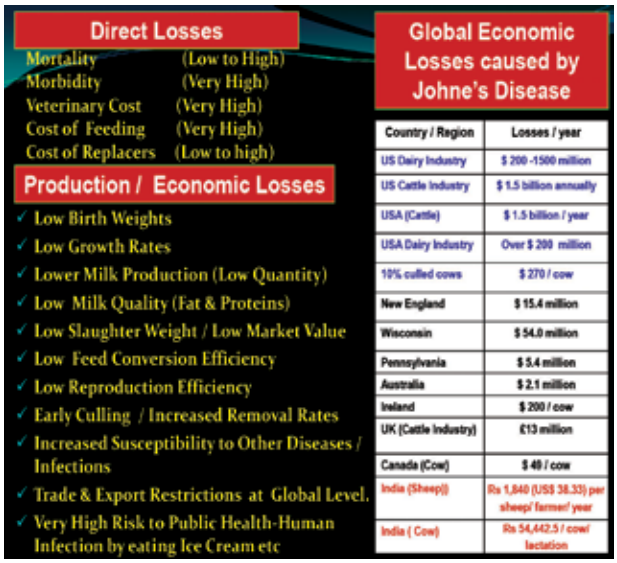


Economic Impact

- Direct losses: Reduced milk yield, reduced salvage value at slaughter, premature/early culling
- Indirect losses: Reduced productive life span, shortens life expectancy, reduced fertility, long calving interval, increased veterinary cost & invites trade ban etc.

Zoonotic Risk

- MAP may cause Crohn's Disease (Inflammatory Bowel Disease) in human
- Other diseases are also linked with MAP infection



Economic Losses: Asia & India

- Economic losses never been estimated despite high Bio-load/prevalence & endemicity of JD.
- 321 million bovines (cattle & buffaloes) population produce 117 million tonnes of milk.
- Per cow production 917 kg/annum, which is below Asian average & behind Pakistan, Iran, Egypt etc.
- Goat meat (Chevon) is lean & is preferred over mutton in tropical climate.
- Is it due to Johne's disease ? YES
- Per sheep/farmer/year is around Rs 1,840.0 (US$ 38.33) in paratuberculosis-affected sheep.
- (Vinodhkumar et al., 2013)
- Per H/F cow/day is approx., Rs 530.0 (US$ 8.83) in paratuberculosis-affected cattle herd.
- @ Rs. 54,442.5/cow/lactation.
- (Rawat et al., 2014, CIRG, Makhdoom)

Milk Yield

Economical losses on the basis of average milk yield (reduced & increased milking) following vaccination in a dairy farm.

Cows in milk \ (n-23)		Milk Production / day (litres)	Decrease in milk / day (litres)	Avg reduction of milk / day (litres)	Average increase in milk yield (litres / day) post vaccination
Stable	Increased Milk				
12	11	407	183	224	49

Bio-burden of MAP in domestic livestock (farm & farmer's animals)

A 33 years study (1985 - 2017)

Profile of samples screened (1985 - 2013)

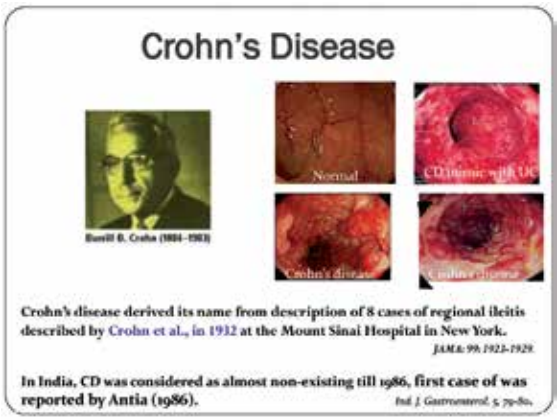
Regions	States	Districts	Species
North	1. Uttar Pradesh[1, 2, 3]	Mathura, Agra, Bareilly, Etah, Raibareilly, Kanpur	Goats, sheep, cattle & buffaloes
	2. Himanchal Pradesh	Palampur	Goats & cattle
	3. Punjab[1, 3]	Ludhiana	Cattle & buffaloes
	4. Haryana[1]	Rohtak	Cattle & buffaloes
East	5. Odisha	Ganjam & Bolangir	Goats
	6. West Bengal	Kolkatta	Goats
	7. Assam	Guwahati	Goats
West	8. Gujarat[3]	Dantiwada	Goats, sheep & cattle
	9. Rajasthan[3]	Bikaner	Goats
Central	10. Madhya Pradesh[3]	Malwa, Bhopal	Goats & cattle
South	11. Kerala[1]	Trichur	Goats
	12. Tamil Nadu[1, 3]	Mannavanur, Puducherry	Goats
	13. Karnataka[1]	Kolar	Goats, sheep & cattle
Total samples (1985 - 2017)			26.009

[1] Farmer's herds, [2] Farm herds (Private), [3] Farm herds (Govt.)

Percent bio-load of Johne's disease

Species	Period A			Period B		Period C	Cumulative
	1985-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2017	(1985 - 2017)
Goats	11.4 (464 /4057)	13.1 (292 / 2221)	11.1 (443 / 3974)	21.5 (533 / 2479)	29.7 (443 / 1490)	39.8 (2394/ 6010)	22.5 (4569 / 20231)
Sheep	ND	ND	ND	25.0 (5 /20)	25.9 (118 / 454)	76.8 (154 / 203)	40.9 (277/ 677)
Sub total	11.4 (464 /4057)	13.1 (292 / 2221)	11.1 (443 / 3974)	21.52 (538 / 2499)	28.8 (561 / 1944)	41.0 (2548/ 6213)	23.1 (4846/ 20908)
Cattle	ND	ND	ND	47.0 (80 / 170)	31.0 (568 / 1799)	53.0 (1116 / 2104)	42.7 (1741/ 4073)
Buffaloes	ND	ND	ND	41.9 (70 / 167)	22.1 (115 / 520)	53.0 (181 / 341)	35.6 (366 / 1028)
Sub total	11.4 (464 /4057)	13.1 (292 / 2221)	11.1 (443 / 3974)	44.5 (150 / 337)	29.0 (673 / 2319)	52.5 (1284/ 2445)	41.3 (2107/ 5101)
Grand Total	11.4 (464 /4057)	13.1 (292 / 2221)	11.1 (443 /3974)	24.2 (688 /2836)	28.9 (1234 /4263)	44.2 (3832/ 8658)	26.8 (5976 / 26009)
	11.6 (1199 / 10252)			27.0 (1922 / 7099)			

Crohn's Disease



Is *M.avium paratuberculosis* a human pathogen ?

- Crohn's disease in human, a severe inflammatory enteritis involving terminal ileum.
- Clinical symptoms of Crohn's disease closely mimic those found in animals with Johne's disease.
- Epidemiological evidence correlating exposure to *M. paratuberculosis* with incidence of Crohn's disease. *(Hermon-Taylor & Tim Bull, 2002; Singh et al, 2014)*
- Pasteurized milk, cheese, other dairy products may not be always free of MAP *(Shankar et al., 2010)*
- Contaminated baby food with MAP expose children and immuno-compromised people at high risk *(Hruska et al., 2011)*

Mass Screening Human population Mathura region

Profile of Human Clinical Samples

Mathura

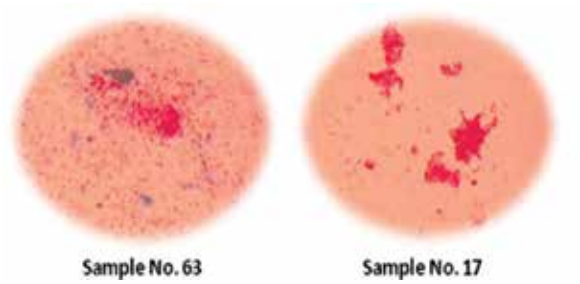
Pathology Laboratory	Human beings n	Single samples (n)		Paired samples (n)	Days n
		Blood	Serum		
1. New Rangeshwar Pathology Centre	15356	5050	11248	942	270 (Av. 102 samples / day)
2. Mathura lab	7779	4901	4993	2115	
3. Swarna Jayanti Hospital	1053	463	749	159	
4. Pathak Pathology	19	19	5	5	
5. Sushila Hospital	61	36	36	11	
6. Varsha Pathology	408	162	275	29	
Total	24,676	10,631	17,306	3,261	

Total 27,937 samples

Bio-burden of MAP in Human Stool Samples Microscopy & IS*900* PCR

Mathura & Agra

Region	Stool samples (n)	Positives, n (%)	
		Microscopy	IS900 PCR
Agra	84	6 (7.1)	3 (3.5)
Mathura	17	0 (0)	0 (0)
Total	101	6 (5.9)	3 (2.9)



Microscopic view of human stool sample (positive slides)

Bio-burden of MAP in Human Population by 'Indigenous ELISA kit'

Samples (n)	S/P Ratio	Status	Sero-status (%)	Total
19,775	0.00-0.09	Negative	178(26.1)	Negative 12987 (65.7%)
	0.10-0.24	Suspected	3837 (19.4)	
	0.25-0.39	Low positive	3972 (20.0)	
	0.40-0.99	Positive	5457(27.5)	Positive 6788 (34.3%)
	1.0-10.0	Strong Positive	1331 (6.7)	

Bio-burden of MAP in human population 'Indigenous ELISA kit': Non-infectious conditions

Non-infectious clinical conditions and ELISA positives

Clinical Profiles	Samples	Strong Positives (%)	Positives (%)	Total Positives (%)
Diabetes type 1	8742	398 (4.5)	2049 (23.4)	2447 (27.9)
Liver disorder	1611	137 (8.5)	581 (36.0)	718 (44.5)
Anemia	2233	205 (9.1)	648 (29.0)	853 (38.1)
Thyroid Disorder	2711	140 (5.1)	638 (23.5)	778 (28.6)
Ion Imbalance	852	126 (14.7)	347 (40.7)	473 (55.5)
Abdominal Disorder	32	03 (9.3)	12 (37.5)	15 (46.8)
Lipid Profile	211	01 (0.4)	98 (46.4)	99 (46.8)
Others conditions: (Urea, UA, LH, PRL)	231	19 (8.2)	50 (21.6)	69 (29.8)
Sub Total	16623	1029 (6.1)	4423 (26.6)	5452 (32.8)

Infectious Conditions & ELISA positives

Clinical Profile	Samples	Strong Positives (%)	Positives (%)	Total Positives (%)
Typhoid	2302	197 (8.5)	799 (34.7)	996 (43.2)
Tuberculosis	246	31 (12.6)	62 (25.2)	93 (37.8)
Inflammatory illness	164	22 (13.4)	41 (25.0)	63 (38.4)
Others (VDRL,TORCH)	440	52 (11.8)	132 (30.0)	184 (41.8)
Sub Total	3152	302 (9.5)	1034 (32.8)	1336 (42.3)

Bio-burden of MAP in Human blood samples by IS*900* PCR

Sn	Sampling Parameters	Samples (n)	Positives (%)
	Non-infectious health problems:		
1	Lipid Profile	121	5 (4.1)
2	Diabetes	451	22(4.8)
3	Liver disorder	71	5 (7.0)
4	Kidney Dysfunction	70	0 (0)
5	Thyroid Disorder	63	0 (0)
6	Anemia	749	37(4.9)
	Sub-Total	1525	69(4.5)
	Infectious diseases:		
7	Typhoid	39	3 (7.6)
8	Tuberculosis	10	0 (0)
9	Others(VDRL, TORCH)	16	0 (0)
10	Skin disorder	5	1 (20.0)
11	Malaria	56	10 (17.8)
	Sub-Total	126	14 (11.1)
	Others:		
12	Normal Healthy Individuals	1246	159 (12.7)
13	Blood groups	196	20 (10.2)
	Sub Total	1442	179(12.4)
	TOTAL	3093	262 (8.4)

Percent Bio-load of MAP* in Human Population: 8 years (2008-2017) - CIRG studies

Species	Period A 2008-2013	Period B 2013-2014	Period C 2014-2015	Period D 2015-2016	Cumulative (2008-2016)
Serum ELISA	(34.0) 7887/23196	(49.2) 190/386	(31.7) 235/740	(14.8) 73/492	(33.7) 8385/24814
Blood PCR	(8.4) 260/3093	(18.1) 4/22	(17.4) 19/109	(10.7) 9/84	(8.8) 292/3308
Stool PCR	(5.9) 6/101	(55.5) 10/18	(44.7) 17/38	(41.6) 5/12	(22.4) 38/169
Total	(30.2) 8153/26390	(47.8) 204/426	(30.5) 271/887	(14.7) 87/588	(30.8) 8715/28291

*Figures in parenthesis are percent

Screening of biopsies of suspected human patients

Tests	Microscopy	IS*900* Tissue PCR
Tissues *n*	10	10
Positives *n (%)*	8 (80.0)	3 (30.0)

Sample ID- H 6, Dr. Lakhan Singh Galav, Pushpanjali Hospital, Agra; **Microscopy**- 4+ (Positive), **IS*900* PCR**- Positive

Sample ID- CH 4, Male, 40 years
Dr. Samir Taneja, Agra
Microscopy- 4+ (Positive)
IS*900 PCR*- Positive

Corrugations in large intestine of human patient (Agra) under went surgery for chronic gastero-intestinal problems

Raw Milk & Paneer samples (1605): (Dec., 2014 – June, 2017): Profile

Sn	Geographical Regions	Places in North India	Species Screened				Total (n)
			Goats	Sheep	Cows	Buffalo	
1.	Mathura dist. & Farah town (Farmers Herds)	Jhandipur & Shahpur	00	00	00	40	653
		Mathura city	10	00	140	34	
		Kurkunda & Bhai	26	12	00	00	
		Villages near Farah town	56	00	18	189	
		Makhdoom	22	00	20	86	
2.	Agra	Agra city	10	4	42	153	209
3.	Gwalior	Sadanwara	5		3	1	9
4.	Jaipur	Jaipur city	9	5	30	00	44
5.	New Delhi	Gajipur	00	00	50	00	68
		Narela			7		
		Harewali			11		
6.	Gurgaon	Kharkhari	20	00	00	00	20
7.	CIRG, Mathura (Farm Herds)	Expt. Goat Unit	60	00	00	00	307
		Jakhrana Goat Unit	109				
		Barbari Goat Unit	127				
		Jamunapari Goat Unit	11				
	Sub-total		465	21	321	503	1310
8.	Mathura Dist.	Farah town	Milk Products		Pooled Milk		240
					Paneer		55
	Grand-total						1605

Public Health Significance

Bio-load: Viable MAP from pasteurized milk

Place of sampling	Sample type	Tests	Bio load (%)	Reference
USA	Pasteurized milk	Culture	2.8	Ellingson et al. (2005)
USA	Pasteurized milk	Culture	2.8	Stabel *et al.* (2002)
UK	Pasteurized milk	Culture	4.8	Millar et al. (1996)
UK	Pasteurized milk	Culture	6.7	Grant et al. (2002)
UK	Pasteurized milk	Culture	3.3	Grant et al. (2005)
UK	Pasteurized milk	Culture	1.8	Grant *et al.*(2002)
Brazil	Pasteurized milk	Culture	2.7	Carvalho et al. (2012)
Argentina	Pasteurized milk	Culture	2.86	Paolicchi et al. (2012)
Ontario	Pasteurized milk	Culture	15.0	Grant *et al.* (2002)
N. Ireland	Pasteurized milk	Culture	6.9	O'Reilly *et al.*(2004)
Czech republic	Pasteurized milk	Culture	1.6	Ayele *et al.* (2005)

Bio-load: Viable MAP from raw milk

Place of Sampling	Sample type	Tests	bioload (%)	Reference
USA	Raw milk	Culture	11.6	Sweeney et al. (1992)
USA	Raw milk	Culture	2.4	Streeter et al. (1995)
USA	Raw milk	Culture	28.6	Stabel *et al.* (2002)
USA	Raw milk	Culture	5.0	Pillai and Jayarao (2002)
USA	Raw milk	Culture	4.0	Pillai and Jayarao (2002)
UK	Raw milk	Culture	6.9	Grant *et al.* (2002)
Argentina	Raw milk	Culture	8.3	Paolicchi *et al.*(2003)
Czech Republic	Raw milk	Culture	2.0	Ayele *et al.* (2005)
N. Ireland	Raw milk	Culture	0.3	O'Reilly *et al.* (2004)
Australia	Raw milk	Culture	35.0	Taylor et al. (1981)
USA	Raw milk	PCR	33.0	Pillai and Jayarao (2002)
Iran	Raw milk	PCR	14.7	Soltani et al. (2008)

Bio-load of MAP in Individual Animal, Pooled Milk & Paneer (1605) using Multiple tests : Species-wise

Animal species, Milk, (*n*)	Positives, *n* (%)						
	Microscopy	IS900 PCR	I_ELISA	d_ELISA	LAT	I_FAT	Culture*
Goats (465)	217 (46.6)	65 (13.9)	182 (39.1)	267 (57.4)	259 (55.6)	227 (48.8)	6/22 (27.2)
Sheep (21)	19 (90.4)	4 (19.1)	15 (71.4)	20 (95.2)	19 (90.4)	19 (90.4)	00/21 RA
Cattle (321)	158 (49.1)	39 (12.1)	168 (52.3)	201 (62.6)	189 (58.8)	181 (56.4)	2/10 (2.0)
Buffaloes (503)	206 (40.9)	67 (13.3)	165 (32.8)	248 (49.3)	222 (44.1)	219 (43.5)	3/16 (18.7)
Sub-total (1310)	600 (45.8)	175 (13.3)	530 (40.4)	735 (56.1)	688 (52.5)	646 (49.3)	11/69 (15.9)
Pooled milk (240)	61 (50.8)	13 (10.8)	101 (84.1)	103 (85.8)	103 (85.8)	77 (64.1)	00/10 RA
Paneer samples (55)	28 (50.9)	30 (54.5)	41 (74.5)	18 (32.7)	35 (63.6)	30 (54.5)	00/10 RA
Grand total (1605)	752 (46.8)	219 (13.6)	762 (47.5)	982 (61.2)	922 (57.4)	835 (52.0)	11/89 (12.3)

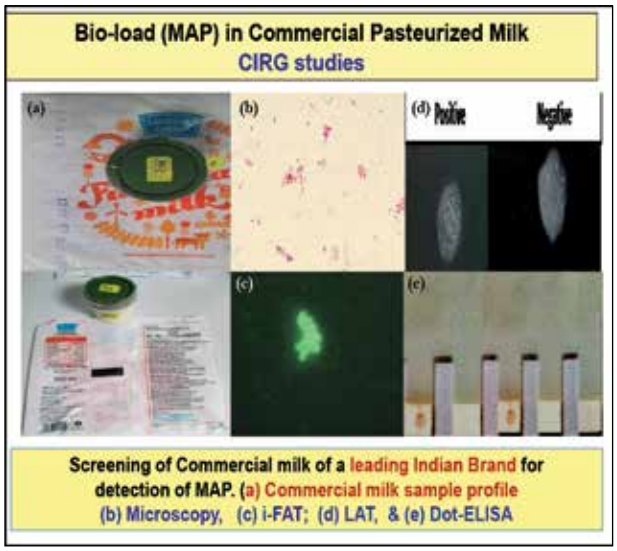
Sample processed: 1. Individual Raw milk (7860), 2. Pooled milk (1440), 3. Milk products (330). Total Samples processed - 9630

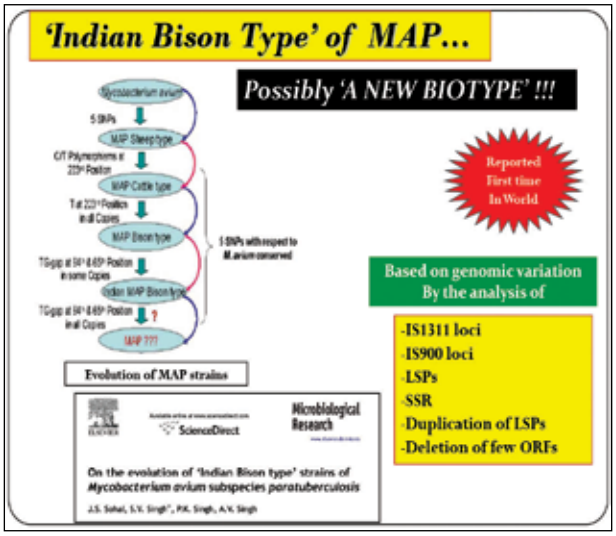
* A few representative milk samples were subjected to primary isolation of MAP on HEY medium

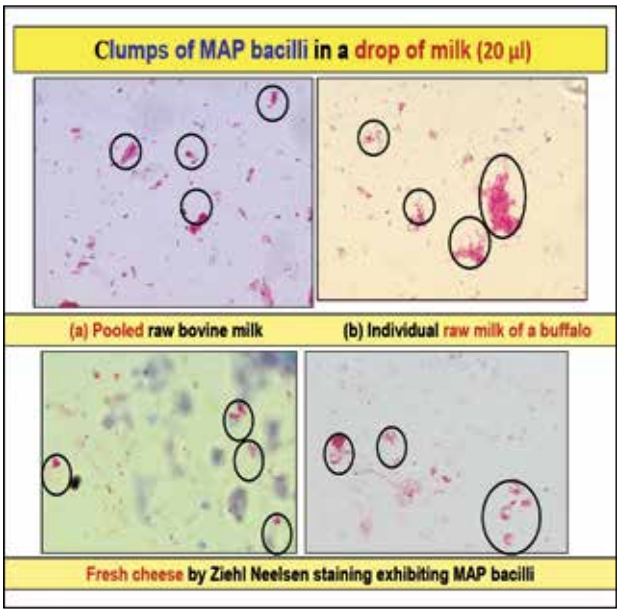
Brand-wise profile of pasteurized commercial milk for the presence of MAP using multiple tests

Sn	Milk Brands		Commercial Milk		Positives	Bio-typing
	Name	Code	Type	(*n*)	% (*n*)	% (*n*)
1.	Amul	A	Liquid milk	70	67.1 (47)	5.0 (3)
			Flavoured milk	10	40.0(04)	00
			Milk powder	10	80.0 (08)	00
2.	Ananda	B	Liquid milk	08	50.0 (04)	00
3.	Nestle, India	C	Milk powder	11	72.7 (08)	22.2 (02)
4.	Gyan	D	Liquid milk	10	100.0 (10)	00
5.	Mother dairy	E	Liquid milk	22	72.7 (12)	00
			Flavoured milk	06	33.3 (02)	00
6.	MTR	F	Flavoured milk	05	40.0 (02)	00
7.	Namaste India	G	Liquid milk	06	66.6 (04)	00
8.	Nova	H	Liquid milk	10	100.0 (10)	20.0 (01)
9.	Paras	I	Liquid milk	14	42.8 (06)	14.2 (01)
			Flavoured milk	04	50.0 (02)	00
10.	Sanchi	J	Liquid milk	10	50.0 (05)	20.0 (01)
			Flavoured milk	03	100.0 (02)	00
Total samples				199	63.1 (126)	6.0 (12)

Figures in parenthesis are percent, **Total samples (*n*) =199**

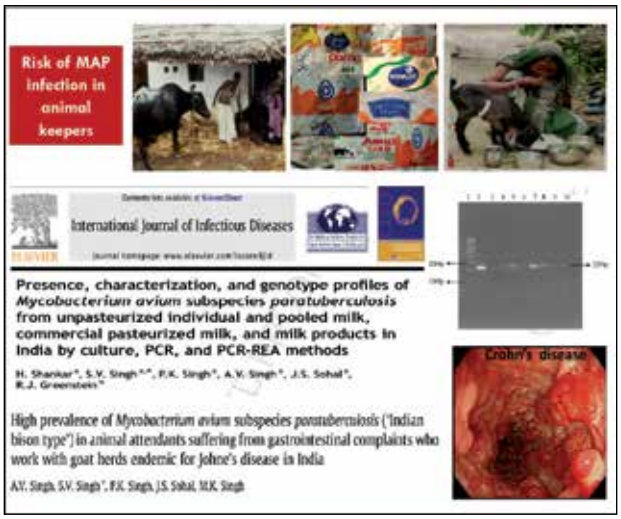


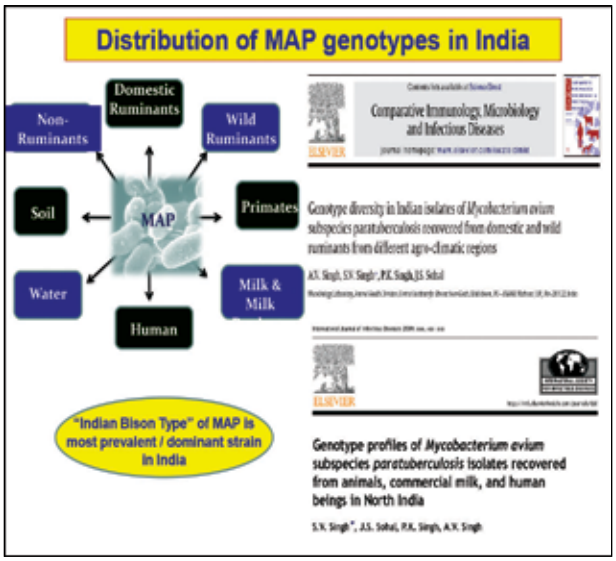


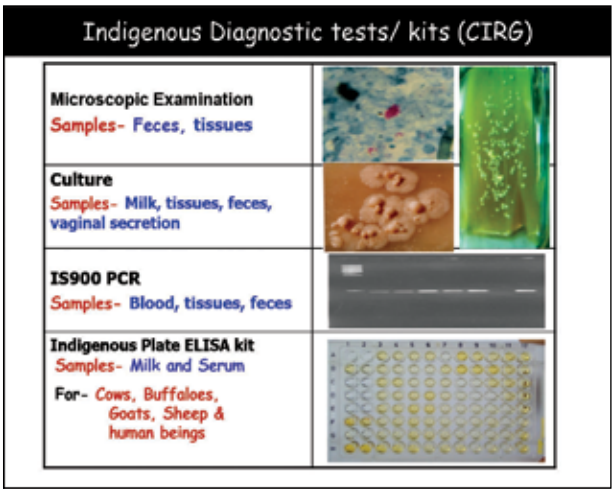


Species and Region-wise Molecular Epidemiology of MAP strains in India by *IS1311* PCR-REA from 2004 – 2016

Livestock Species	States	IS900 positive DNA (n)	MAP bio-type (IS1311 PCR_RE)	
			Indian Bison Type (n)	Cattle Type (n)
Goats	1. Uttar Pradesh	141	141	NIL
	2. Himachal Pradesh	5	5	NIL
	3. Madhya Pradesh	7	7	NIL
	4. Assam	3	3	NIL
	5. Rajasthan	6	6	NIL
Sheep	1. Uttar Pradesh	15	15	NIL
	2. Tamil Nadu	20	20	NIL
Cattle	1. Uttar Pradesh	123	119	4
	2. Punjab	13	11	2
	3. Himachal Pradesh	6	6	NIL
Buffaloes	1. Uttar Pradesh	29	28	1
	2. Punjab	13	11	2
	3. Tamil Nadu	2	2	NIL
Commercial milk	1. Uttar Pradesh	4	4	NIL
Grand Total		387	378 (97.6%)	9 (2.3%)







New Tests developed and validated for detection of 'MAP' in domestic livestock

New Tests

- Nano-immuno Rapid test

Complimentary Tests

- Dot ELISA test
- Latex Agglutination Test
- Fluorescent Antibody Test

Taqman probe q-PCR

Traditional tests

(for Comparative Study)

- Indigenous ELISA kit
- IS*900* PCR on milk and blood
- Microscopy

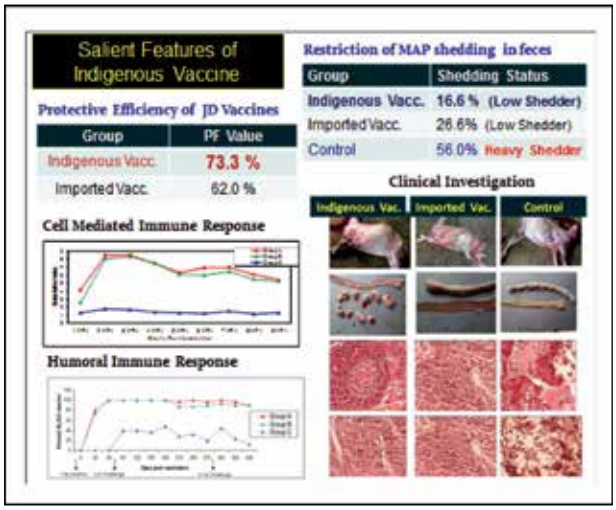
Culture

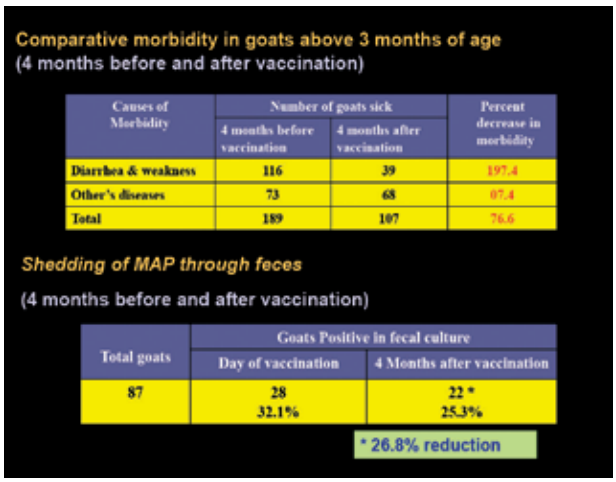
Indigenous Vaccine

Gudair" Most popular Imported vaccine

Salient Features of Indigenous Vaccine

1. Prepared using MAP 'Indian Bison Type S-5' Isolate
2. Efficacy is better compared to imported vaccine
3. Induces long lasting CMI & Antibody Response
4. No Adverse Reactions-Totally Safe
5. Confer high protection
6. **Can be used as Prophylactic and Therapeutic Vaccine**





Improvements in physical traits of Jamunapari herd

Feed lot experiments:

Year	Average body weights in Kg.		
	3 M	4 M	5 M
2005-06 (non-vaccinated)	10.8±0.39	12.6±0.52	13.1±1.15
2006-07 (vaccinated)	12.85± 0.46	14.38±0.37	16.15±0.57

Age at first kidding (AFK):

Year	AFK (in days)
2005-06, (non-vaccinated)	767±24, (n= 56)
2006-07, (vaccinated)	739± 29, (n= 53)

Production Performance of Goat Kids (Body Weights)

Years	Season	Birth Weights	Weight at 3 months	Weight at 6 months
2005-06 (Non-vaccinated)	Nov-Mar	3.11 ±0.54	9.69 ±0.49	13.16 ±0.33
2006-07 (Vaccinated)	Nov-Mar	3.38 ±0.46	11.21 ±0.56	16.0 ±0.06

Reproductive performance of the goats (kidding % & litter size)

Year	Season	No. of Animals	Kidding %	Litter size
2005-06 (non-vaccinated)	Nov-Mar	193	126	138
2006-07 (vaccinated)	Nov-Mar	132	137	142

Improvements in Milk Yield

Vaccination of kids born to vaccinated goats of Jamunapari farm herd, CIRG, Makhdoom:

-A total of 107 kids (50 males and 57 females) were vaccinated on 20.4.07 to 22.4.07

- 9.5% kids were sampled for fecal microscopic examination and serum before vaccination

Antibody status (S/P ratio) of young animals before and post 2 months vaccination.

Category	Day of vaccination	2 month post vaccination
Negative	0	0
Suspected	0	0
Low Positive	0	0
Positive	5	3
Strong Positive	5	7

Fecal microscopic examination:

No fecal samples (out of 10) of kids were positive at zero day post vaccination by fecal microscopic examination

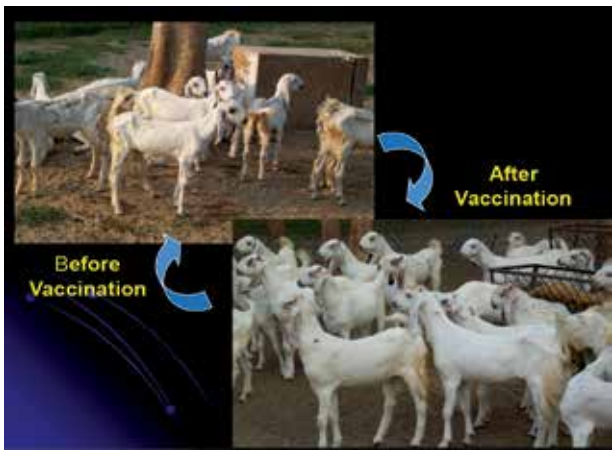
Other Improvements

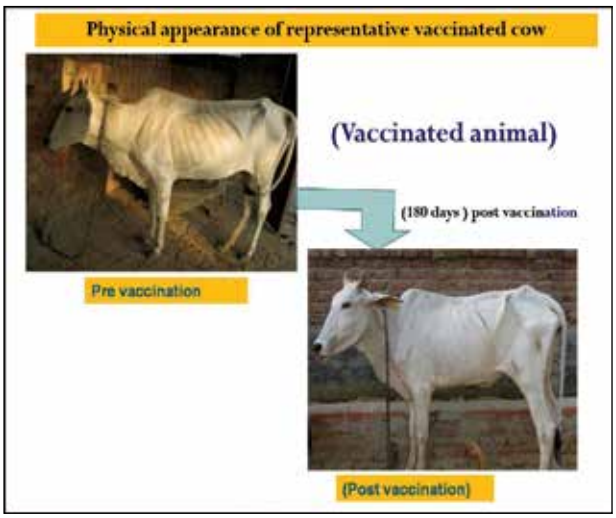
- Incidence of mortality in kids & up to 6

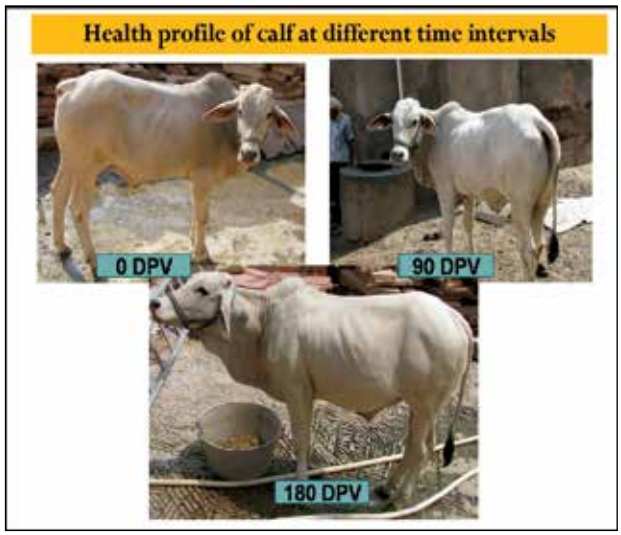
	Years	Season	Milk Yield at 90 days	Total Milk Yield		
2005-06 (non-vaccinated)	Oct-Nov., II[nd] phase				72.05 ± 4.00	119.68 ± 4.20
2006-07 (vaccinated)	Oct-Nov., II[nd] phase				97.05 ± 5.07	141.2 ± 2.14

- Other ImprovementsIncidence of mortality in kids & up to 6 months of age significantly declined.
- Incidence of Coccidiosis infection in kids reduced by 20% in the year 2006-07.

Of the 34 stunted kids (already listed for culling at the start of vaccination, but were not culled on request), 24 recovered to normal health after vaccination.






Health profile of calf at different time intervals
0 DPV
90 DPV
180 DPV

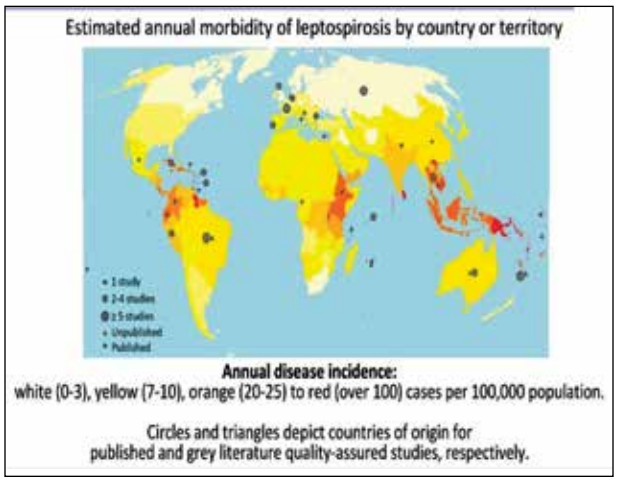

Licence for Vaccine manufacture:
Drug controller and Licencing Authority granted permission to manufacture the Vaccine under Licence no. KTK/28D/11/2008 Dated 15/09/2014


DIVISION OF BIOLOGICAL STANDARDIZATION
INDIAN VETERINARY RESEARCH INSTITUTE
Approval of Vaccine:
Vaccine is Sterile and Safe


स्थापना दिवस समारोह
Country's first Indigenous Vaccine against incurable Johne's disease released to the Nation
Date ; Foundation Day_CSIR, 26th Sept. 2015
Venue: Vigyan Bhawan, New Delhi
NRDC Meritorious Invention Awards
Date : 24th March, 2017
Venue: Indian National Science Academy, New Delhi

Topic: Early Diagnostic Approach of Leptospirosis in Animal Practice

Speaker: Kiran N Bhilegaonkar Training and Education Centre ICAR-Indian Veterinary Research Institute Shivajinagar Pune.



Outline

1. Introduction:
2. Incidence/prevalence
3. Organism
4. Diagnosis
5. Isolation
6. Direct visualization
7. Serological
8. Molecula
9. Serological

One of the common zoonoses in India

- Synonyms: Weil's disease, Seven-day fever, Mud/ swamp/canefield fever, Autumn fever (Akiyami fever - Japanese), Haemorrhagic jaundice, Spirochetosis
- Classical disease : One health approach
- Complex relationship between humans, animals and ecosystems
- Reservoirs: Rodents, domestic and wild animals
  - Temporary carriers: Domestic animals such as cattle, dogs, pigs and wild animals (Days to several months)
  - Permanent carriers: Rodents (throughout their life)

Magnitude of Leptospirosis

Estimated 1.03 million clinical cases annually

- 58,900 deaths
- 2.90 million DALYs lost each year

Global Burden

Sr. no	Animal Species	Serovars observed

Indian Scenario of Leptospirosis

Endemo-epidemic

- Gujarat
- Kerala
- Andamans
- Tamil Nadu

At risk states

- Maharashtra
- Karnataka
- Andhra Pradesh
- West Bengal
- Odisha
- Lakshwadeep
- Goa

1	Buffalo	Javanica, Canicola, Batavi, Copenghageni Sejroe, Hurstbridge, Ictero, Hebdomadis, Tarrasovi, Pomona, Australis, Shermani, Pyrogenes, Hustbridges, Kaup & Sejroe
2	Cattle	Hardjo, Tarrasovi, Shermani, Ictero, Pomona, Hebdomadis, Shermani and Pyrogenes
3	Dog	Tarrasovi, Pomona, Canicola, Pomona, Australis, Autumnalis and Djasiman
4	Rat	Icterohaemorrhagiae, Copenhageni, Grippotyphosa and Ballum, Tarrasovi, Pyrogenes, Hebdomadis, Pomona, Shermani, Canicola, Australis, Autumnalis, Hustbridge (NIVEDI, 201

Animal reports

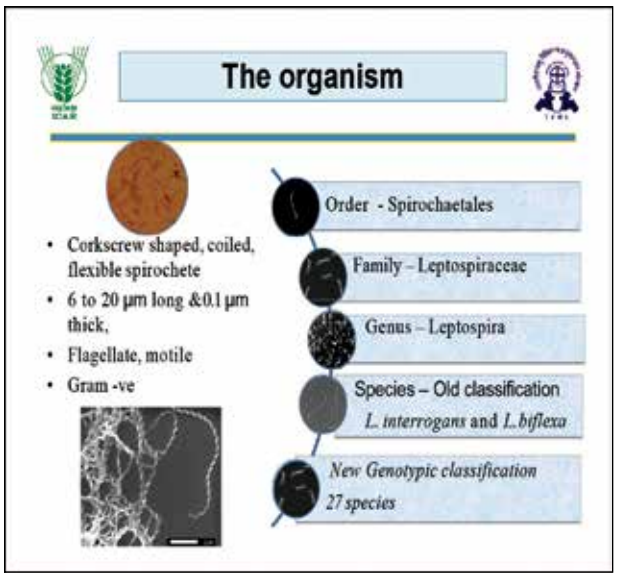
States	Animal species
High prevalence	
Tamil Nadu, Kerala, Andaman	Cattle, buffalo, sheep, goats, pig`
Moderate prevalence	
Maharastra,U.P., M.P., Gujarat, Karnataka	Cattle, buffalo, goats, sheep, pigs, dogs, horse
Rare reports	
Punjab, J&K, Rajasthan, North- Eastern Hills, HP	Cattle, sheep

- Cattle – 11-68 %
- Buffalo – 11-35%
- Sheep – 7-56%
- Goat – 13-75%

Serovars in Animals

The organism

- **Serologically classified in serovars:** On the basis of structural heterogeneity of LPS
- 30 serogroup - over 300 serovars with about **250 pathogenic serovars**
- Genetic classification – No correlation with serological classification
  - Serovars of the same serogroup may be distributed between different species



Human Serovars

	Serovars
Human	**Pomona, Javanica ,Copenghageni, Pomona, Australis, Autumnalis, Djasiman Tarrasovi, Shermani**

- **Serological classification** widely used: Provides useful information for clinical or epidemiological investigations.
- The accepted nomenclature:
  - *Leptospira* (generic name) *interrogans* (species name) serovar Hardjo strain Hardjoprajitno.

Leptospira species in India Human and Animal

- Pathogenic - ***L. borgpetersenii* / *L. interrogans*** (30.3%),
- Intermediate species (14.14%)
- ***L. krischneri*** (8%)

Risk Factors

- Heavy rainfall and surface flooding
- Alkalinity, moisture and temperature of the soil
- Close association of Humans with domesticated animals
- Occupational exposure/Agricultural practices- Paddy
- Reservoir and carrier host excretion
- Duration and concentration in urine
- Urban Factors
- Cleanliness and sanitation at public places
- Population density
- Contact with rodent

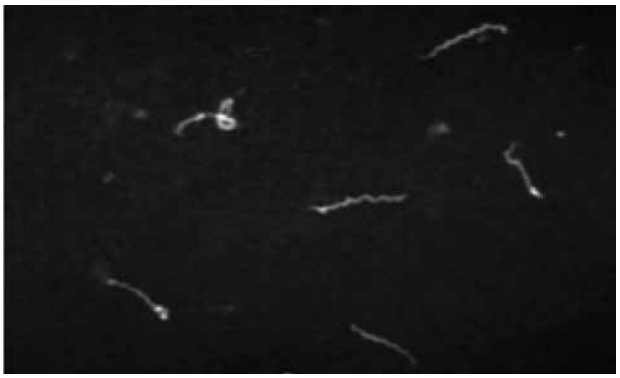
ISOLATION

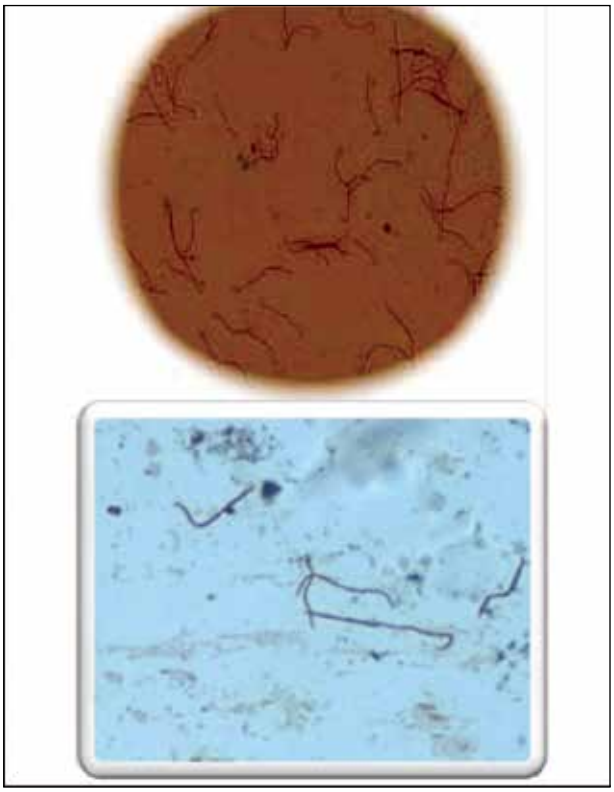
- Ideal from a purist standpoint
- Not a commercially available option
- Samples: Urine, blood and CSF
- Better isolation rates
  - Diuretics followed by urine collection
- Urinary excretion/positive for several weeks/months
- Depending on serovars may take several weeks to be positive

- Extremely expensive, time consuming, difficult

Visualization of the Organism in Clinical Samples

- Dark field microscopy
- Silver staining
- Direct immuno-fluorescence (DFA)
- Immunohistochemistry
- Samples
  - Urine, Blood, CSF, Tissues
- Less sensitive and specific
  - Organisms disappear within a day or two of therapy - false negative results
  - Require about 10^4 cells/ml





Serological Tests

- Microscopic Agglutination Test (MAT)
- Enzyme Linked Immunosornebt Assays (ELISA)
  - IgM and IgG
- Latex Agglutination Test
- Lateral Flow Assay

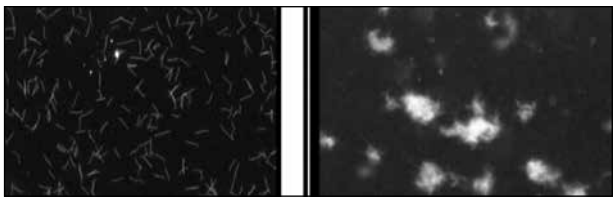
Immunofluorescence Test

Microscopic agglutination test (MAT)

- Most commonly used test in veterinary medicine
- Gold Standard among serological tests for leptospirosis
- Tested against multiple serovars in different wells.

INTERPRETATION : Factors considered

- Endemic areas
- Vaccination status (Dogs)
- Serosurveys
- Paired /repeat sera testing



Interpretation

- Single titre 1:100 significant
- Endemic area 1:400
- Non endemic area 1:100, 1:200
- Serosurvey 1:50

Dogs

- A titer > 1:800 against a serovar that the dog has not been vaccinated
- A titer > 1:3,200 against a serovar that the dog has been vaccinated

Disadvantages

- Negative at early stage of infection
  - clinical signs
  - Problem can be overcome by repeating the test after 10-14 days
- No differentiation : Vaccine antibodies and natural exposure

- Not possible in all Labs

ELISA

- Common test for screening in humans
  - IgM and IgG ELISAs
- Veterinary Medicine
  - Different species
  - Commercial ELISA available for cattle, dogs
    - Cattle: Bovine Leptospira *hardjo* IgM/IgG ELISA Test Kit
    - Canine – IgG and IgM
- **Limitations**
  - No differentiation of vaccinated and infected animals
  - IgG ELISA not useful in early phase
  - Detection of all pathogenic serovars
  - Costly and not easily available

Rapid Point of Care tests

Lateral Flow Immuno-Chromatographic Assay

- Bovine
  - LiliF Bovine Leptospira IgM kit (iNtRON Biotechnology)
- Dogs
  - WITNESS® Lepto (Zoetis) – (detects IgM antibodies)
    - Canicola, Grippotyphosa, Icterohaemorrhagiae, Pomona
  - SNAP Lepto Test (Idexx)
  - Imunofluorescence Test
- Dogs

Molecular Tests

- PCR / Real Time-PCR
  - Leptospiral DNA in urine, blood, CSF and tissues
- Rapid and Confirmatory
- Early diagnosis
- Not all labs have capacity
- Low sensitivity - In veterinary clinical cases
- Inconsistent tubular shedding of organisms
- Low rate of positivity after antibiotic treatment –Dogs

IVRI Research

Development of diagnostics

- Serological assays
  - Recombinant protein based ELISAs
- Molecular tests
  - PCR, Real-Time PCR – Pathogenic serovars

Sero-surveys in animals

- Cattle, pigs, sheep, goats, dogs

Diagnosis Human

- **Presumptive**
  - Positive IgM ELISA/LFA/LAT
  - MAT titre > 1:100/200/400 or above single sample
  - Visualization of organism-Direct Microscopy/ staining
- **Confirmatory**
  - Isolation
  - Four-fold rise in titre in MAT (paired sera)
  - Positive by PCR/Real-time PCR
  - Positive by any two different tests (serology/ molecular/Direct demo/rapid tests)

Conclusion

- Important disease affecting both animals and humans
- Diagnosis is challenging – Need reliable test
  - Early infection
  - Detection of all pathogenic serovars
  - Easily available/commercial
  - Serological test - Differentiating vaccinated and infected
- Diagnostic infrastructure strengthening
- Veterinary and Public Health partnership: Create synergies in high risk areas for joint surveillance and detection
- One Health Approach for Prevention and control

Topic: In the diagnosis faced by medical practitioners with regard to Leishmaniasis

Speaker: Dr Ravindra S Kembhavi Professor (Additional) Community Medicine Department Seth G S Medical College & KEM Hospital

What is leshminasis?

- It is Neglected Tropical Disease
- Caused by infection lesishmania parasite
- Spread by bite of sandfly
- Present 3 Forms- Visceral, Cutaneouses,mucocutaneous

Problem faced world wide

- This Parasitic diseases endemic in 98 countries worldwide, with over 350 million people living at risk and the annual case incidence ranging from 0.7 – 1.3 million
- Diseases present 'New areas' (South and the Central America) and the 'Old' World (Southern Europe, Africa, Middle East, Central Asia and Indian subcontinent).
- Leishmaniasis ranks next only to malaria as the second worst in the age-standardized DALYs (disability-adjusted life years) and second only to dengue fever in the rate of DALY increase, from 5.7 to 5.9 million

Problem in India:

The subcontinent accounts for nearly 70% of the world's anthroponotic VL cases, amounting to several hundred thousand annual cases . India has the world's highest national VL incidence, Nepal and Bangladesh being the next.

Life Cycle of Leishmaniasis

EPIDEMIOLOGICAL DETERMINANTS

- Agents:
- Leishmania Donovani
- Life Cycle is completed in two different hosts
- Vertebrate – Amastigote form
- An insect- Flagellated Promastigote form.
- Reservoir of Infection:
- Dogs, jackals, foxes, rodents.
- In India it is Non zoonotic.(man as sole resorvoir)
- **Host factors:**
- Age
- All age groups, in India Peak Age (5-9 years)
- Sex
- Males > Females.
- Population movements
- Migrants, labourers, tourists.
- Socioeconomic status
- More common in poor
- Malnutrition
- Occupation
- Farming, forestry, mining, fishing
- Immunity
- Recovery from kala azar gives Life Long Immunity.

Mode of transmission

- Person to person-Contact with active lesion of CL
- By the bite of Female Phlebotomine Sandfly P.argentipes
- Blood transfusions
- Extrinsic Incubation Periods – 4 to 25 days
- Incubation periods in man- 1 to 4 months

Visceral Leishmaniasis

- There are several different forms of leishmaniasis in people.
- Some people have a silent infection,
- without any symptoms or signs
- VL are known as Kala azar
- It is chronic infection with
- progressive emaciation and weakness.
- Substantial weakness
- Irregular bouts of fever
- Hepatospleenomegaly
- Lymphadenopathy
- Anaemia
- If untreated , the fatality rate is 95 %

Cutaneous leishmaniasis &Mucosal leishmaniasis

- Cutaneous manifestation leishmaniasis, develop within a few weeks or months of the sand fly bite in the form of sores
- The sores may start out as papules (bumps) or nodules (lumps) and may end up as ulcers (like a volcano, with a raised edge and central crater); skin ulcers might be covered by scab or crust.
- Mucosal leishmaniasis a sequela (consequence) of infection cause sores in the mucous membranes of the nose (most common location), mouth, or throat.

Epidemiology Issues:

- Leishmaniasis is found in focal areas of 90 countries in the tropics, subtropics, and southern Europe. The ecologic settings range from rain forests to deserts.
- The disease often reaches epidemic
- proportions in areas of low endemicity due to natural or man-made disasters, including famine, drought, flood, earthquakes and civil wars
- The poor socio-political background of the afflicted has largely contributed to the minimal interest shown towards leishmaniases by the policy makers, and even scientists, with resultant lack of good diagnostics and chemotherapeutic agents to enable effective management and control of this infection.
- Leishmaniasis usually is more common in rural than in urban areas, but it is found in the outskirts of some cities.
- Climate and other environmental changes have the potential to expand the geographic range of the sand fly vectors and the areas in the world where leishmaniasis is found
- Leishmaniasis is found in people on every continent except Australia and Antarctica
- In many geographic areas where leishmaniasis is found in people, infected people are not needed to maintain the transmission cycle of the parasite in nature; infected animals (such as rodents or dogs), along with sand flies, maintain the cycle.
- However, in some parts of the world, infected people are needed to maintain the cycle; this type of transmission (human—sand fly—human) is called anthroponotic.
- In areas with anthroponotic transmission, effective treatment of individual patients can help control the spread of the parasite.

Issues in India

- India has the largest burden of this disease in the world.
- The disease affects the poor who cannot afford the expensive investigations and treatment.
- It is estimated that 80 per cent of the patients suffering from VL earn less than $2 a day. Because host defense against this intracellular infection is T-cell dependent, VL has joined the list of AIDS related opportunistic infection in endemic areas.

Laboratory findings

- Parasitological diagnosis.-Demonstration of LD bodies in aspirates of spleen, liver, bone marrow, lymph nodes or in the skin. Visualization of parasites in the clinical samples from symptomatic patients constitutes the time-honored gold standard for definitive diagnosis of leishmaniasis
- Aldehyde test.-Widely used in India.
- Serological test -DAT (Direct Agglutination Test) , rk39 dipstick test, ELISA and Indirect Fluorescent antibody test (IFAT).
- Leishmanin (Montenegro test)
- Hematological findings-Anaemia, leucopenia, reversed albumin-globulin ratio.

Diagnosis Issues

- Some people have a silent infection, without any symptoms or signs
- Skin manifestations of PKDL include hypopigmented macular/papular/nodular or polymorphic lesions as well as a combination of these conditions. Involvement of the mucosa and other associated symptoms such as itching are rare
- Apart from skin lesions, PKDL patients are clinically healthy and can perform daily activities. This explains why these patients usually do not seek medical care, and they remain unnoticed by the health system if they have not been actively researched.
- PKDL patients, especially those with papules and nodules, continue to transmit the infection to others through sandfly bites.
- The diagnosis of PKDL remains a big challenge for experts, especially in the macular form of the disease. LD parasite can be demonstrated in 90% of skin specimens of cases with nodular lesions. Unfortunately, in macular cases, the sensitivity of conventional

microscopic examination of skin specimens is only about 3%

- Urgent need for new diagnostic tool(s) with high sensitivity and specificity for PKDL.

TREATMENT

- In 2010, the WHO Expert Committee on Leishmaniasis, recommended Liposomal Amphotericin B (LAMB) in a single dose of 10 mg/kg as the first choice treatment regimen for the Indian Subcontinent (ISC).
- In selected districts, Amphotericin B emulsion has been approved.
- The combination regimen (Injection Paromomycin-Miltefosine for 10 days) is also recommended.
- Miltefosine 28 days regime and Amphotericin B as multiple doses may also be used.
- In PKDL i) Liposomal amphotericin B: 5mg/kg per day by infusion two times per week for 3 weeks for a total dose of 30mg/kg,orMiltefosine: 100mg orally per day for 12 weeks, or Amphotericin B deoxycholate: 1mg/kg over 4 months 60-80 doses, [as per WHO guidelines on diagnosis and management of PKDL, 2012-

Treatment issues

- The mainstay of treatment for leishmaniasis is chemotherapy
- But none of the drugs in use had been specifically designed and developed for treating this disease, i.e. antimonials (meglumine antimoniate or glucantime®, sodium stibogluconate or Pentostam®), miltefosine, pentamidine, amphotericin B, ketoconazole and paromomycin
- For the treatment of VL, the first line of drug is SAG, which has low response rate in several endemic districts of Bihar. the mode of action of these compounds remains largely unknown.
- Pentamidine is another drug of second line but due to its side effect in the form of insulin dependent diabetes, it has not found favour amongst the doctors.
- VL being the disease of neglected people belonging to low socio-economic strata of the population, the other antileishmanial drugs like amphotericin B, amphotericin B lipid complex are not cost effective.
- Oral drug, miltefosine, is very promising for treating VL cases, as it is very efficacious and easy to administer at the field level.
- The chemotherapeutic agents widely available for treatment of leishmaniasis are toxic with prolonged use resulting in significant side effects and even death due to renal and/or cardiac complications. Better alternatives are urgently needed and drug repurposing is a promising strategy for finding new agents for oral or topical administration with anti-*Leishmania activity Amphotericin B-liposome (AmBisome®),*
- A superior but expensive drug, is limited in use in endemic areas of poverty.
- Appearance and spread of drug resistance is also a major cause of concern hence, as extensively reviewed.
- Chemotherapy of CL faces the dilemma of its necessity, due to the dogma based on its tendency for self-resolution. However, treatment hastens healing, thereby minimizes the scar formation, prevents spread, progression in to more complicated disease forms, such as MCL and helps to avoid poor responsiveness of protracted disease
- Alternative approaches for treating CL are now available by using physical means e.g. thermotherapy that uses radio-frequency generated heat (RFHT) that is cost-effective and safe .
- Immunoprophylaxis during the treatment of VL so as to enhance Th1 cellular immune responses along with a well-tuned immunoregulatory response to infection may prevent the development of PKDL after treatment of VL..

Kala Azar Elimination Program:

- The Government of India (GOI) launched a centrally sponsored Kala-azar Control Programme in the endemic states in 1990-91.
- The GoI provided drugs, insecticides and technical support and state governments provided costs involved in implementation.
- The program was implemented through State/District Malaria Control Offices and the primary health care system.

Disease reduced: 1992-77102 to 2015-7277

- National Health Policy-2002 set the goal of Kala-azar elimination in India by the year 2010 which was revised to 2015.
- Continuing focused activities with high political commitment, India signed a Tripartite Memorandum of Understanding (MoU) with Bangladesh and Nepal

to achieve Kala-azar elimination from the South-East Asia Region (SEAR).

- Presently all programmatic activities are being implemented through the National Vector Borne Disease Control Programme (NVBDCP).

GOAL

- To improve the health status of vulnerable groups and at-risk population living in Kala-azar endemic areas by the elimination of Kala-azar so that it no longer remains a public health problem.

TARGET

- To reduce the annual incidence of Kala-azar to less than one per 10,000 populations at block PHC level.

OBJECTIVE

- To reduce the annual incidence of Kala-azar to less than one per 10 000 population at block PHC level by the end of 2015
- Reducing kala-azar in the vulnerable, poor and unreached populations in endemic areas;
- Reducing case-fatality rates from kala-azar to negligible level;
- Reducing cases of PKDL to interrupt transmission of kala-azar
- Preventing the emergence of kala-azar and HIV/TB co-infections in endemic areas.

THE ELIMINATION STRATEGY

- Early diagnosis & complete case management
- Integrated Vector Management and Vector Surveillance
- Supervision, monitoring, surveillance and evaluation
- Strengthening capacity of human resource in health
- Advocacy, communication and social mobilization for behavioral impact and inter-sectoral convergence
- Programme management

Early diagnosis and complete case management

- This is done for eliminating the human reservoir of infection through early case detection.
- Effective case management includes diagnosing a case early along with complete treatment and monitoring of adverse effects.
- This strategy will reduce case-fatality and will improve utilization of health services by people suspected to be suffering from the disease.

CASE DEFINITION

- A 'suspect' case: history of fever of more than 2 weeks and enlarged spleen and liver not responding to anti malaria in a patient from an endemic area.
- All patients with above symptoms should be screened with Rapid Diagnostic Test and if found positive should be treated with an effective drug.
- In cases with past history of Kala-azar or in those with high suspicion of Kala-azar but with negative RDT test result, confirmation of Kala-azar can be done by examination of bone marrow/spleen aspirate for LD bodies at appropriate level (district hospital) equipped with such skills and facilities.

Integrated Vector Management (IVM)

For the optimal use of resources for vector control.

- The main objective is to reduce longevity of the adult vectors, eliminate the breeding sites, decrease contact of vector with humans, and reduce the density of the vector.
- This approach improves the efficacy, cost-effectiveness, ecological soundness and sustainability of disease-vector control.

The five key elements of IVM include capacity building and training, advocacy, collaboration, evidence-based decision-making and integrated approach.

Advocacy, communication and social mobilization for behavioral impact and Inter-sectoral convergence

- The patients are from the poorest in the community and often poorly nourished. Access to care remains an issue in at-risk population and other under privileged sections of communities.
- Inadequate utilization of health services and lack of faith in public health systems by the affected population are major barriers in achieving elimination.
- Need for advocacy, communication and social mobilization through all the existing methods (wall writing, hoardings, banner, pamphlets, radio gingles etc) as per the local context
- Opportunities should be explored to spread the messages during Chath puja, fares, melas Display of messages particularly during campaigns which are community

based and inter-personal communication are considered the best methods for spreading awareness.

Strengthen the supervision, monitoring, surveillance and evaluation

- The line listing of cases at village level to identify hot spot areas (villages reporting five or more KA cases in previous or current year) and update areas for micro planning for spray operations.
- these preventive measures:
- As per WHO's has found that in South East Asia, 15-20% of KA patients seek treatment in the private sector.
- Information from private sector is essential to have better picture of burden of disease and sustain the gains achieved towards elimination.
- Frequency of active search increased from single to quarterly. Active search " Kalazar Fort Night" is carried out by health worker & volunteers
- An incentive of Rs300 is provided to ASHA to identify a case, Rs100 forensuring one round & Rs 200 for two rounds of insecticidal spraying
- Even the patients being treated in the Hospitals will be given Rs 500 as compensation of daily wages for the time spent in the hospital for Kalazar & Rs 2000 for PKDL
- Independent evaluation to be carried out periodically

Prevention & Control

- No vaccines or drugs to prevent infection are available. The best way for travelers to prevent infection is to protect themselves from sand fly bites. To decrease the risk of being bitten, follow

Further

- WHO to define a road map for prevention, control, elimination, and eradication of 17 NTDs, including VL, as a step toward achieving the Sustainable Development Goals
- 5 key strategies described viz. early diagnosis and complete case management, effective disease and vector surveillance, social mobilization and building partnerships, and clinical and operational research, to achieve the elimination goal..
- Extension of support to enable better access to drugs and related interventions, and monitor progress towards VL elimination by 2020 with all stake holder involvement

To conclude for regional elimination of L. donovani-induced leishmaniasis

- To become a reality, effective deployment of existing and new tools will be essential.
- A strong political & active community participation with inter country cooperation and partnerships.
- Appropriate diagnostic and treatment services
- Effective epidemiological surveillance

Introduction

Leishmaniasis is an important complex of protozoal vector-borne diseases that affects both humans and animals.Few Leishmania organisms are maintained in humans, but most circulate mainly in animals.Most of the latter organisms are zoonotic.It is transmitted by sandflies and can be difficult to prevent as some of the drugs used for treatment have significant side effects or limited or limited availability outside endemic regions.

In humans, leishmaniasis has three general forms:

- Cutaneous leishmaniasis
- Mucocutaneous leishmaniasis
- Visceral leishmaniasis

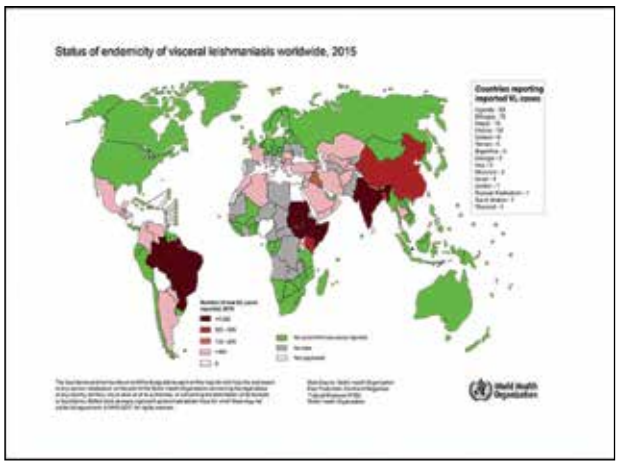
Different species of *Leishmania* tend to cause

Cutaneous leishmaniasis, a form typically remains limited to skin, can be caused by numerous organisms.Few species regularly affect the mucous membranes, as well as the skin. Both cutaneous and mucocutaneous leishmaniasis may result in disfigurement, however, mucosal involvement is generally more serious.L. donovani and L. infantum, cause most cases of visceral leishmaniasis characterized by damage to the internal organs and fully symptomatic cases are at times life threatening. Most species of the Leishmania are maintained in wildlife, often without clinical signs ,but dogs are an important reservoir host for L. infantum.Dogs are also the domesticated animal most often affected by leishmaniasis. Clinical cases in this species can be life threatening and may be difficult to treat. Cases occasionally seen in guinea pigs, cats, equids and captive or free living wild species. Ruminants are rarely affected.

Human Visceral Leishmaniasis

- Mainly caused by Leishmania donovani and l. infantum. *L. chagasi* is now considered to be a subspecies *of L. infantum.*

- Visceral leishmaniasis is ocassionally caused by other species including organisms that are normally associated with cutaneous leishmaniasis (e.g.,) L. tropica, L. braziliensis etc.,
- Some cases caused by skin-tropic Leishmania invades the viscera in a person supposed to be suppressed.

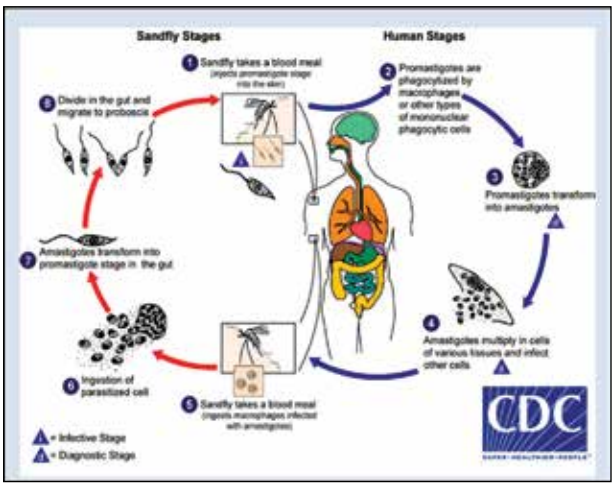


Leishmaniasis in Animals

Many of the organisms that causes leishmaniasis in humans have also been found in clinical cases in animals.L. macropodum and L. enrietti affect animals but have not been found, to date in humans The distinction between cutaneous and visceral syndromes is not seen in animals, at least with L. infantum, Canine leishmaniasis generally refers to infections with this organisms. However, dogs can also be infected by other Leishmania species.With two significant exceptions (L. donovani and L. tropica), Leishmania are maintained primaily in animals. Infections are common ,clinical cases have been reported in in fewer host species. However, it does not imply that other species cannot be affected, particularly as the Leishmania found in sick animals are rarely identifies to the species levelAmong domesticated animals, dogs are mostly affected by leishmaniasis.L. infantum is thought to be responsible or most clinical cases, but other orgnaisms including L. mexicana, L. colombiensis, L. amazonensis, L. braziliensis, L. major and L. tropica etc., have also been found. Zoonotic Potential Humans are affected by L. tropica, L. donovani and most species of Leishmania maintained in mammals, and they are primary reservoir hosts for L. tropica and L. donovani.

Vectors

- *Leishmania* that infect mammals are usually transmitted by *phlebotomine* sandflies in the genera *Phlebotomus* and *Lutzomyia*, which act as biological vectors.
- Each species of *Leishmania* is adapted to development in specific species of sandflies. Sandfly activity usually occurs when it is humid and there is no wind or rain. These insects are generally most active at dawn, dusk and during the night.
- Other arthropods like *Culicoides sp*. midges, ticks and canine fleas have been suggested as possible mechanical vectors for some *Leishmania.*
- Symptomatic and sub-clinically infected mammals can infect sandflies. Whether infected animals and people can clear Leishmania completely from the body and under what circumstances, is still not confirmed.
- However, animals and humans can be infected asymptomatically for long periods, and they may remain chronically infected even after clinical cure.
- Direct horizontal transfer is also possible.



- Leishmania spp. do not remain viable outside a host or in-vitro culture.
- Inactivated by agents such as 1% sodium hypochlorite, 70% ethanol, 0.1% hand soap etc.,
- Infected animals often remain asymptomatic for long periods or indefinitely, but these animals may develop leishmaniasis at any time. In dogs it may range from months to years.

Signs

- Visceral signs include lethargy, weight loss, a decreased appetite, anaemia, splenomegaly and local or generalized lymphadenopathy.
- Fever can be intermittent, and absent in many cases.
- Chronic renal disease is common in canines, including bleeding disorders such as epistaxis, hematuria and melena.

- Neurological signs
- Reproductive losses
- Skin lesions
- Ocular signs
- Disease is also developed in cats, equines, rarely in cattle and other ruminants ,captive wild species and wild animals.

Post-mortem lesions

- Gross lesions are quite variable and may be minimal in some cases.
- In canids, lesions may include cachexia, signs of anaemia, generalized lymphadenopathy, hepatosplenomegaly, areas of alopecia with desquamation on the head and trunk, and cutaneous ulcers or nodules.
- Ulcers and petechiae are occasionally seen on the mucous membranes, and in some cases, hemorrhages may be evident in internal organs.
- Small, light colored nodular foci (granulomas) may be found in variety of organs.

Infection in Humans

- People can carry some species of the Leishmania asymptomatically for long periods of indefinitely.
- The incubation period for cutaneous leishmaniasis is 1-2 weeks to several months and for visceral leishmaniasis is approximately 2 Weeks to several years, with many cases become apparent in 2-6 months.
- Visceral leishmaniasis is insidious, chronic disease among the inhabitants of endemic region
- A primary granuloma sometimes appears on the skin before systemic signs become evident.
- Thrombocytopenia may cause bleeding tendencies, including petechiae or haemorrhages on the mucus membranes and leukopenia can result in increased susceptibility to other infections.
- Other reported symptoms include coughing, chronic diarrhea, darkening of skin, lymphadenopathy, edema etc. Some people who recover from visceral leishmaniasis develop post kala azar dermal leishmaniasis.

Diagnosis

- Leishmania parasites and their nucleic acids may be found in lesions, secretions, blood and various tissue samples.
- Direct observation of the parasite in skin scrapings from lesions, or lymph nodes, spleen and bone marrow aspirates using Giemsa-Wright's, Leishman's or other strains.
- PCR assays can detect nucleic acids in tissues. Most of these tests cannot identify Leishmania to the species level.
- PCR can be combined with other techniques, sch as restriction fragment length polymorphism(RFLP) analysis or sequencing, for species identification.
- ELISA, IFA, CFT,IHA etc.,

Diagnostic Tests

- Cutaneous leishmaniasis : Direct observation
- PCR, immuno-histochemistry or culture as in animals.
- Amastigotes are easiest to detect
- Delayed hypersensitivity test Montenegro skin test may be useful in the diagnosis of cutaneous and mucocutaneous leishmaniasis,especially outside endemic areas
- IFA,
- Direct agglutination,
- ELISA,
- Fast agglulutination screening test
- Rapid Immunochromatic assay
- K39 Dipstick or strip test

Immunological Methods

Method	Antigen	Advantage	Limitation
Montenegro skin test	Killed whole parasites	Low cost and detection of T cell immunity	May not detect cases of visceral leishmaniasis in some stages of the disease. Cannot differentiate between infection and disease, nor active and progressive disease. Risk of recurrence.
Enzyme-Linked Immunoabsorbent Assay (ELISA)	Recombinant molecules	Low cost and high sensitivity and specificity	Sensitivity and specificity is highly dependent on the antigen used
Immuno fluorescence	Killed whole parasites	High sensitivity and specificity	Laborious process, time and cost consuming. Need of trained personnel to perform the test.

Flow cytometry	Recombinant molecules and/ or killed whole parasites have been tested	Better sensitivity and specificity when compared with all other methods. Small amount of blood. Can differentiate between infection and disease, and cured patients.	Cost associated with reagents and equipment. Few studies yet.
Rapid Antibody Test (RAT)	Recombinant molecules	Low cost, small amount of blood, fast	Sensitivity and specificity is highly dependent on the antigen used
Direct Agglutination Test (DAT)	Killed whole parasites	Low cost, small amount of blood	Need of long incubation time, well-trained laboratory technicians, antigen cost, and quality controlled antigen

Molecular Methods

Methods	Advantage	Limitation
Conventional PCR (cPCR)	High sensitivity, specificity and accurate results. Many applications in molecular analysis. Easy diagnostic interpretation.	Unable to quantify the target DNA. Qualitative test. Time consuming. Limited detection range of some assays.
Quantitative real-time PCR (qPCR)	Higher sensitivity, specificity and security, quantitative capacity and speedy results. Possibility of species differentiation by melting temperature.	High cost due to equipment (thermocycler). Difficulty in interpreting the results, needing thus of a well-trained operator.
Nested-PCR (nPCR)	Higher specificity and sensitivity. Useful technique for studying the molecular epidemiology in the field.	Time consuming and higher cost. Unable to quantify the target DNA. Qualitative test.

Quantitative Nucleic Acid Sequence-Based Assay (QT-NASBA)	High specificity. It is based on an isothermal reaction and thus overcomes the need for a thermocycler; ideal for lower-tech laboratories. Quantitative capacity. Indicated to detect active diseases; RNA detection.	It uses electrochemiluminescence as tool of detection, which involves more handling steps and procedure time. Assays developed only for RNA detection. Few studies yet.
NASBA coupled with oligo-chromatography (NASBA-OC)	High specificity. Speedy results. There is no need of complex laboratorial structure. Simple dipstick format for the detection of amplification products. RNA detection.	Unable to quantify the target RNA. Assays developed only for RNA detection. Few studies yet.
Loop-Mediated Isothermal Amplification (LAMP)	High sensitivity. Low cost. Isothermal reaction, there is no need for a thermocycler. The temperature stability of the reagents enables its use in field conditions.	Unable to quantify the target DNA. Qualitative test. Few studies yet.

Method/clinical form	Specimen	Antigen/target	Sensitivity (%)	Specificity (%)
Immunological tests:				
ELISA/VL	Human Serum	rK39	96	100
TRALd/VL	Human serum	rK39, K26	100	98
FC-ALPA/CL	Human serum	Live L. braziliensis promastigotes	85.7–97.9	76.0–93.7
FC-ALPA-IgG/CL	Human serum	Live L. braziliensis promastigotes	86	78
FC-AFPA-IgG/CL	Human serum	Fixed L. braziliensis promastigotes	90	78
Molecular tests:				
cPCR/VL	Human blood	ITS-1, kDNA minicircle	53.7–97.78	61.82–100
cPCR/VL	Canine blood	ITS-1, kDNA minicircle	72.2–98.7	83.3–96.4
qPCR/VL	Human blood	ITS-1, kDNA minicircle	91.3–100	29.6–100
NASBA-OC/VL	Human blood	18S RNA; 18S DNA	79.8–93.3	100
LAMP/VL	Human blood	kDNA minicircle	96.4	98.5
LAMP/PKDL	Human tissue biopsy	kDNA minicircle	96.8	98.5
LAMP/VL	Canine blood	cysteine Protease B (cpb)	38.2–69.5	65.2–89.5

Treatment

- Pentavalent antimonials (sodium stibogluconate, meglumine antimonate)
- Allopurinol
- Liposomal amphotericin B
- Paramomycin
- Miltefosine
- Live Vaccines

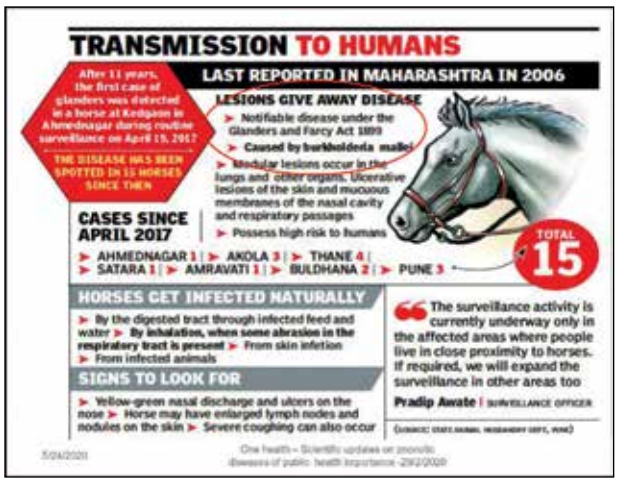
What is required to done?

Indian focus

- An integrated approach
- Drug resistance
- Host-parasite interaction
- Biochemical mechanism involved
- Asymptomatic carriers
- Molecular process involved

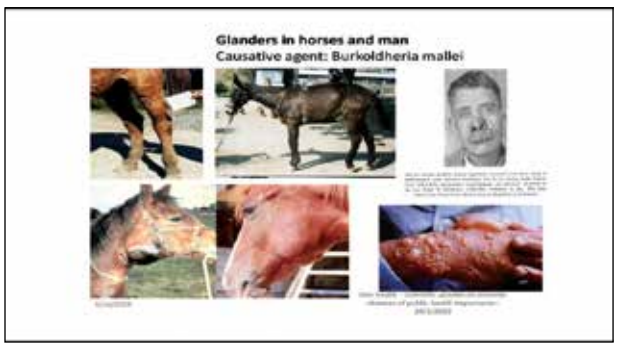
Topic: Diagnostic approach to glanders in human and animal practice

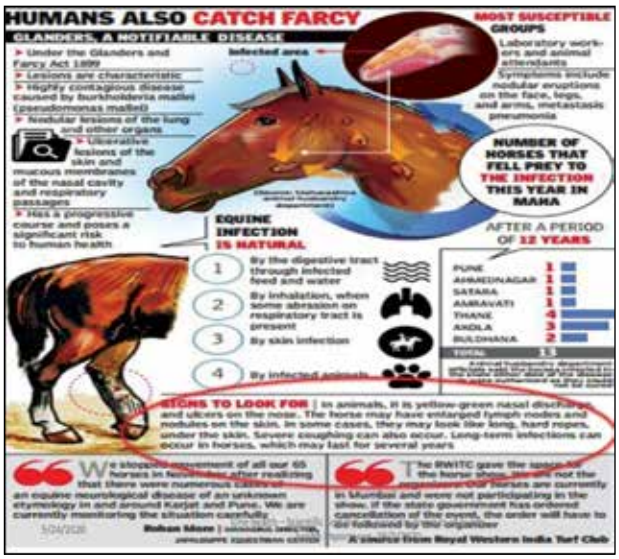
Speaker: Dr. S.B. Majee, Professor of Microbiology, Mumbai Veterinary College



Latest updates

- The most recent cases of Glanders in horses were reported in Aurangabad on 27/2/2020
- Two horses were suspected and confirmed for glanders by serological and cultural tests. Another 86 horses are being tested on similar lines
- Based on the steps outlined in the Infectious diseases Act 2009, the horses were euthanized and buried at Padegaon after sprinkling the site with Calcium carbonate.
- The bacterium has been considered as a potent bioterrorism agent that can be highly fatal for humans as per the National Action Plan for Control and Eradication of Glanders in India, 2019
- No vaccine is currently available for humans or animals to protect against *B. mallei* infection.





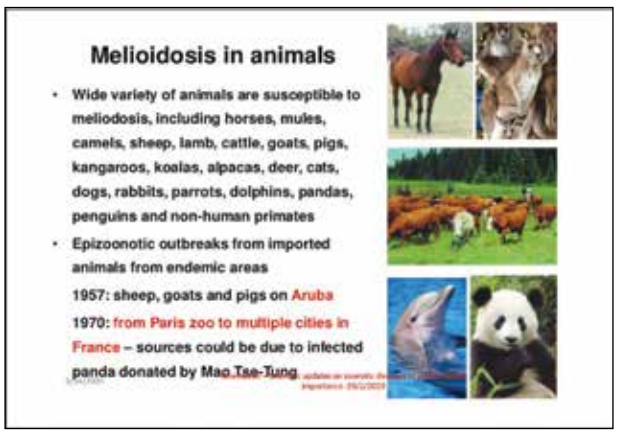
Conventional diagnosis of Glanders

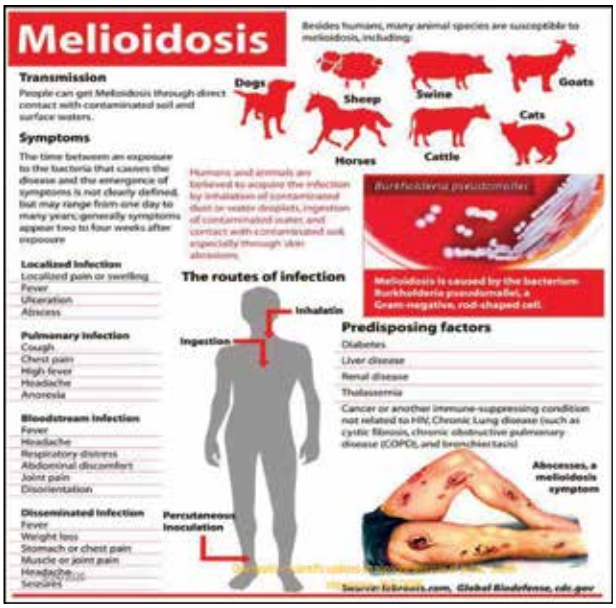
Testing of Glanders in horses
Intradermopalpebral test using Mallein

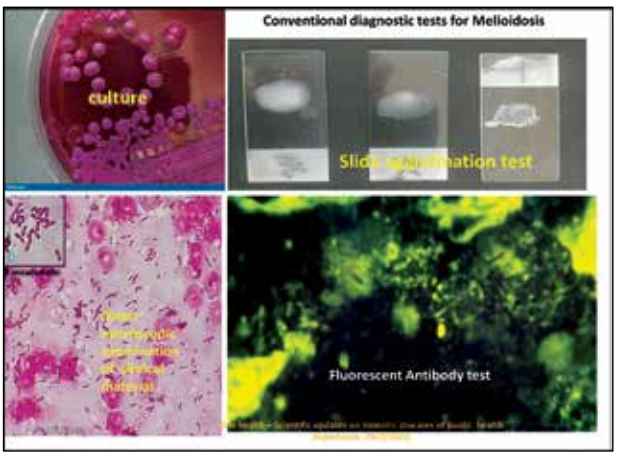
- The mallein test
  - is not generally recommended because of animal welfare concerns
  - is useful in remote endemic areas where sample transport or proper cooling is not possible

Melioidosis

- Burkholderia pseudomallei is the causative agent of melioidosis also called as Whitmore's disease/Paddy field disease/Nightcliff garderners disease/Pseudoglanders
- It is an important soil bacterium, denitrifying organic materials and is ubiquitous in those areas.
- B. pseudomallei is stable in the environment.
- Importance – to discriminate the two pathovars – B. pseudomallei (motile) and B. mallei (non motile)
- It is also naturally resistant to various antibiotics and disinfectants







- Burkholderia pseudomallei has an extremely broad host range including wildlife, farm animals and humans

Differential diagnosis

- Glanders in horses can manifest itself in nasal, pulmonary and cutaneous forms.
- Purulent yellow – green nasal discharges
- Paroxysmal coughing
- Enlarged lymph nodes
- Cord-like lesions along the lymphatic tracts (Farcy pipes)
- Melioidosis in horses can manifest itself in various forms including peracute and acute
- In general, however, the course is subacute to chronic, lasting from 3 weeks to 3 months with no loss of appetite.

- Further symptoms are emaciation, weakness,oedema and lymphangitis of the limbs, mild colic,diarrhoea, pneumonia, cough and nasal discharge
- Skin involvement has been reported initially resembling fungal eczema, which later become papular without abscess formation.
- Acute meningoencephalitis and keratitis have been reported.
- In areas where the infection is acquired mainly per os, intestinal symptoms may predominate.

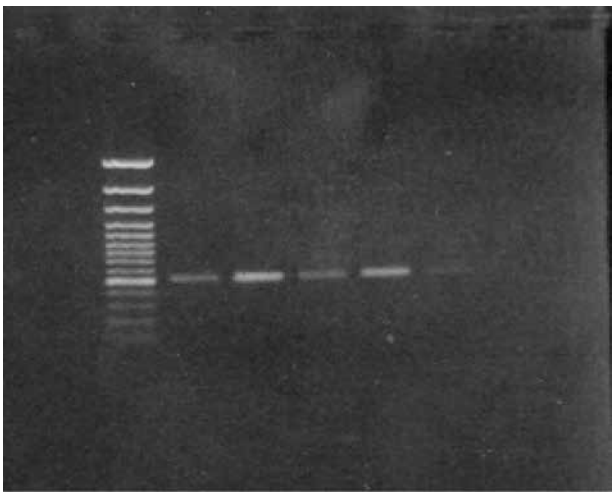
Molecular approach in Glanders and Melioidosis

Genome of *B. mallei*

- The genome for B. mallei is made up of two circular chromosomes.
- Chromosome 1 is where genes relating to metabolism, capsule haride biosynthesis are located.
- B. mallei has polysaccharide capsule which indicates its potential as a pathogen.
- Chromosome 2 is where most of the information regarding secretion systems and virulence-associated genes are located.
- Multilocus sequence typing has revealed that B. mallei most likely evolved from a B. pseudomallei clone reduction.
- About 1000 B. pseudomallei genes are absent or varying in the B. mallei genome.
- B. mallei's genome also has a large amount of insertion sequences – used for pyrosequencing as we will discuss later.

Molecular methods vs ELISA

- To date, a positive result in real-time PCR confirms the diagnosis of 'Burkholderia mallei' for an isolate and the diagnosis of 'glanders' in clinical cases.
- future genetic evolution may well result in B. mallei clones that can no longer be detected by these standard PCRs.
- Both plate and membrane based ELISAs have been used for the serodiagnosis of glanders, but none of these procedures has been able to differentiate between *B. mallei and B. pseudomallei*.
- B mallei specific PCR showing 526 bp product with M 23-2 and CVMP 23-1 primers
- PCR assay targeting the flagellin P (fliP)-I S407 A genomic region of B mallei for specific detection of organism in pure cultures and clinical samples - 989 bp fragment was amplified
- The sensitivity of the PCR assays for clinical samples is unknown. A negative result therefore, is no proof of the absence of B. mallei in the sample
- Other genetic techniques used to distinguish these two organisms include PCR–restriction fragment length polymorphism
- Real time PCR 526 bp



Other molecular methods

- Molecular typing by pulsed field gel electrophoresis (Chantratita et al., 2006),
- Ribotyping (Harvey & Minter, 2005),
- Multilocus sequence typing (MLST) (Godoy et al., 2003)
- Variable number tandem repeat (VNTR) analysis (Currie et al., 2009)
- Molecular typing and whole genome sequencing may be useful in the future (Gilling et al., 2014; McRobb et al., 2015; Price et al., 2015).

Ribotyping

- Sexton et al. (1993) proposed another ribotyping system based on SalI, HindIII and PstI resulting in 10 ribotypes of *B. pseudomallei*
- ribotyping proved its value in outbreak investigations in animals and humans by identifying the source of contamination and showing that melioidosis is saprozoonotic
- animal-to-human transmission occurs only occasionally.

PFGE & MLST

- PFGE has been employed successfully in epidemiological studies on glanders & melioidosis in the past
- Pitt et al. (2000) found 226 PFGE profile types (in contrast to only 44 ribotypes) within 350 B. pseudomallei strains
- Another technique, used worldwide, is MLST (Godoy et al., 2003).
- They chose seven housekeeping genes in B. pseudomallei, sequenced 147 isolates and identified 71 sequence types.
- On the basis of these data, they were able to show that the results obtained in MLST are comparable with the gold standard PFGE.

VNTR

- Variable number of tandem repeats (VNTR) analysis may be another promising tool for typing of strains in endemic countries of Asia, Africa or South America
- It is cheaper and easier to carry out than PFGE & MLST
- None of these tests have been so far validated either for Glanders or Melioidosis

Newer tests

- Pyrosequencing can be used to determine the presence or absence of an insertion sequence IS407A within the flagellin P (fliP) gene and
- to exploit the difference in orientation of this gene (23srRNA region) in the two species.
- Oligonucleotide primers designed to selectively target the IS407A-fliP interface in B. mallei and the fliP gene specifically at the insertion point in B. Pseudomallei are used
- The ability of pyrosequencing to identify short nucleotide sequences gives the assays specificity vital to the successful identification and differentiation of the two Burkholderia species

Conclusions

- No standardised system exists for differentiating between B. mallei and B. pseudomallei.
- Though a number of tests are available, no international standard for medical/veterinary microbiology in diagnostics of melioidosis/Glanders exists which is the drawback in reliable proceedings.
- No evaluated test kit neither based on the detection of specific antibodies /specific antigens, nor on the amplification of species specific DNA sequences is commercially available.
- Efforts have to be made for closing this gap in future.

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5	Dr Adesh E. Chopde	MVC, Mumbai	Veterinary
6	Dr Aditi Dey	KEM Mumbai	Medical
7	Dr Aftab A. Siddiqui	KEM Mumbai	Medical
8	Dr Akila P.	JJH Mumbai	Medical
9	Dr Akruti P. Pachpinde	MVC, Mumbai	Veterinary
10	Dr Akshay Joshi	Dept.Physiology	Veterinary
11	Dr Ambati Vikas Satyanarayan	Dept. of Poultry Science, MVC, Mumbai	Veterinary
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