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वेक्टर VECTOR पत्रिका

E-Newsletter of ICMR-Vector Control Research Centre, Puducherry

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JOIN HANDS TO SPREAD AWARENESS AGAINST VECTOR BORNE DISEASES!

वेक्टर VECTOR पत्रिका

Volume 1 Issue 3 July 2021

Editorial Board

Response:
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The Editorial from Director's Desk

My warm greetings to all!

I invoke heavenly and scientific powers to protect you and your dear ones from COVID-19. VCRC is grateful to the Secretary Department of Health Research (DHR) & Director General Prof. Balram Bhargava for graciously elevating the status of M.Sc. Public Health Entomology (PHE) course run by the VCRC to the National Public Health Entomology course by expanding the same to four other ICMR Institutes viz., RMRC Dibrugarh, RMRC Gorakhpur, RMRIMS, Patna and NIRTH, Jabalpur by increasing the seats from 12-20 at VCRC and also stipend from Rs. 6000-20000 per student per month and from Rs. 3000 to Rs. 10000 for in-service candidates admitted to this course. In all a total of 100 students with M.Sc. PHE degree shall pass out from the five ICMR institutes and will go a long way to build much needed entomological capacity in the country enabling national programme to effectively control/eliminate Vector Borne Diseases (VBDs) with these well trained personnel. Besides, with this tremendous support, the course will attract bright students from across the country, increase competition and would therefore generate quality manpower. ICMR Administration and Finance Division also deserve our profuse thanks for taking prompt decisions in this venture. To strengthen research and training on VBDs, VCRC took several concrete steps by Signing MOUs with Bharatiar University, Coimbatore, Sri Balaji Vidyapeeth Pondicherry and Academy of Council of Scientific Research (AcSIR), Noida. With these steps, our plan is to enrol 40 PhD Scholars by 2022. We also had a comprehensive dialogue and brainstorming session with French Institute Pondicherry to forge a formal collaboration for research on environmental aspects that support and promote vector borne diseases. It is laudable that VCRC Field Station Madurai organized two training workshops on 15th and 16th March on "Introduction to Genetic Data Analysis" and 22nd and 23rd March on "Vector Biology and Genetics" supported by SERB. These workshops were well attended. Dr Bhavna Gupta Scientist C and colleagues deserve accolades for these events. One of the greatest contributions of the ICMR-VCRC has been the discovery of highly potent *Bacillus thuringiensis israelensis* (B-17) strain which is at par with World's best and WHO recognized strain of *Bti* IPS-82 supplied by the Pasteur Institute. VCRC *Bti* (B-17) has been successfully commercialized in India to 20 licensees. These commercial firms were facing difficulty to register this strain without IPS-82 which is no more available. The inventors and I impressed upon Central Insecticide Board Registration Committee (CIB&RC) to accept the VCRC strain as Indian standard strain. It is heartening to note that after the serious deliberations and submission of supporting documentation CIB&RC has accepted VCRC *Bti* strain as Indian standard strain (ISBTI VCRC B-17). This is a great institutional effort of three decades culminating to this great event. The three main inventors Dr. K. Balaraman, Dr. S. L. Hoti and Dr. Manonmani and several Technical and support staff deserve ovation for this great feat. Unfortunately, Dr Balaraman could not rejoice this moment as we lost him on 22nd of May, 2021 due to COVID-19 infection (Please see page 30 to know more about him). The 'Matribhasha' divas was organized in the institute on 17th-19th March. 2021. There was tremendous response to this event and staff spoke in Tamil, Telugu, Hindi, Assamese, Malayalam, Jessary, Marathi, Bhojpuri, Kannada, Badaga, Punjabi, Urdu and Sanskrit. To help the working women staff, the institute has set up a Day care centre with all amenities for the children to play, take rest and learn from interesting games and toys. A special emphasis has been laid to the hygiene and safety of the children. This centre has brought tremendous relief to the working staff with small children. For the welfare of the staff, diabetes detection programme was organized on the 18th of March, 2021 with the help of Dr. Mohan's diabetes speciality centre. Several employees benefitted from the event. International Women's Day was observed on 8th March, 2021. The Centre celebrated 'Swachhta Pakhwada' from the 1st to the 14th of April, 2021. Several members of VCRC Hygiene Committee, staff and students participated in the cleaning activity in the neighbourhood of the VCRC especially the police residential and Office complex. To support Pondicherry Govt., the VCRC has been conducting COVID-19 RT-PCR tests. The VCRC staff engaged in this service deserve all appreciation. All the resources were provided by the ICMR. VCRC has resolved to continue to make scientific strides, give impetus to innovation and product development, patents and commercialization of its technologies through Transfer of Technology (ToT). For the same, setting up of an innovation hub has been planned. The VCRC staff has bid farewell to five of its illustrious staff viz., Dr. R. L. J. De Britto Scientist-F, Dr. V. Vasuki Scientist E, Dr. B. Nanda Scientist-C, Dr. G. Prbhakaran and Dr. A. Krishnakumari Principal Technical Officers. We wish them and to all the readers safe days ahead. Please take very good care of yourself and your dear ones with all necessary precautions. "JAI HIND"

Malaria Control in Rameswaram Island – A Success Story

Dr. S. Sabesan, Senior Consultant, ICMR-VCRC, Puducherry

The Problem: Rameswaram Island, situated in Palk Bay on the south-east coast of India, had been highly endemic for malaria through 1970s caused by both *Plasmodium vivax* and *P. falciparum*; and was a major contributor to the malaria problem in Tamil Nadu. The crisis reached its zenith in the island with a total of 28,427 cases in a population of about 55,600 [Annual Parasite Incidence: 511.27] during 1979 which literally means that every second person was afflicted with malaria disease.

The Preliminary investigation

The epidemiological studies conducted in Rameswaram Island and coastal mainland revealed

- Majority of the inhabitants of the island were the fisherman, who engaged in perennial fishing. They moved from one place to the other for fishing and stayed in temporary camps depending on season and fish availability. Such seasonal fishing camps attracted fisherman from the mainland coastal villages also.
- The parasitological and entomological studies carried out in these places revealed that some of the camps were highly vulnerable to the movement of individuals with malaria infection and highly receptive for vector (*Anopheles culicifacies*) proliferation.
- Rameswaram being a holy place, received pilgrims from all over India and Nepal. *P. falciparum* cases recorded from the pilgrims of North India indicated the potential risk of the importation of chloroquine-resistant parasite strains into the island.
- Also, a large number of passengers in the transit from various countries, many of whom were at risk of malaria transmission, stayed in the island before or after visiting Sri Lanka, as Ferry Services were available between Rameswaram and Sri Lanka.
- As per the Tourism Department and Port Authorities, a total of 56,403 people visited Rameswaram between January & October 1983, either for tourism, or pilgrimage or in transit on their way to Sri Lanka or back. [Till 1988, access to Rameswaram was only by Rail, and opening of Annai Indira Gandhi Road Bridge paved way for booming of pilgrimage and tourism, again].

Specific Exploratory Activities

- During 1982- '83, the VCRC monitored and recorded the movement of fishermen in various seasonal camps by searching / interviewing them and also by accompanying them.
- In 9 fishing camps, 412 of 1098 families had migrated from mainland villages; 686 families had migrated from villages within Rameswaram Island.
- A mass blood survey conducted in the camps revealed that 138 of 4073 (3.38%) individuals were positive for malaria; 107 of 680 (15.7%) fever cases were due to malaria. This clearly indicated high parasitic load in the community and active ongoing transmission.

The Gaps identified

- lacking of a system to monitor the transient population
- absence of vector surveillance in the fishermen camps
- poor knowledge on the role of migration associated with malaria persistence

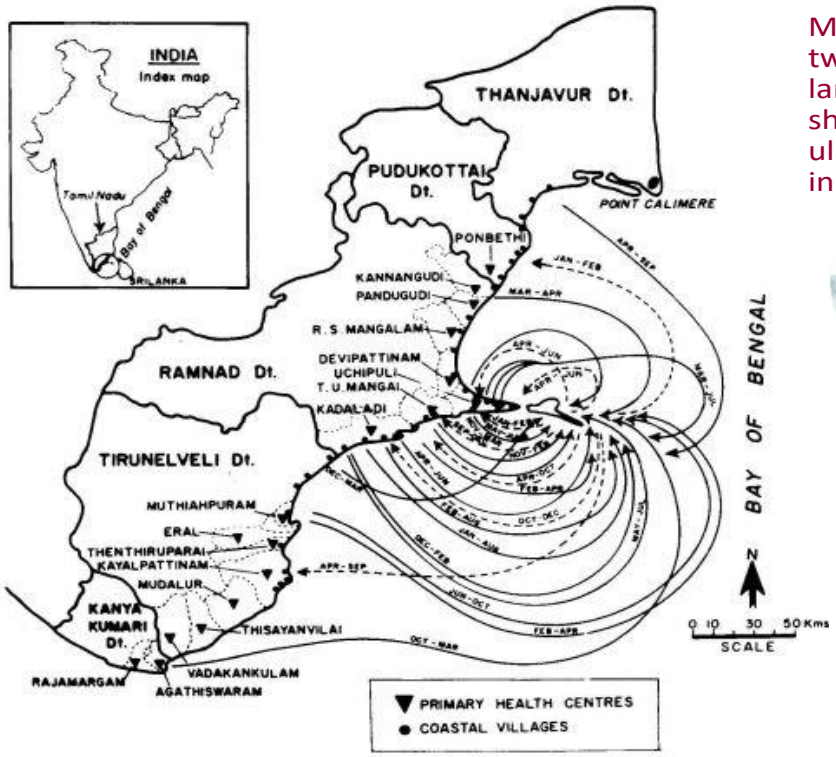
"Based on scientific assessment, it was ascertained that the Population movement was a major cause for malaria persistence in Rameswaram island and each family was issued with 'Migration Follow-Up Card' [MFC]"

The intervention approaches adopted

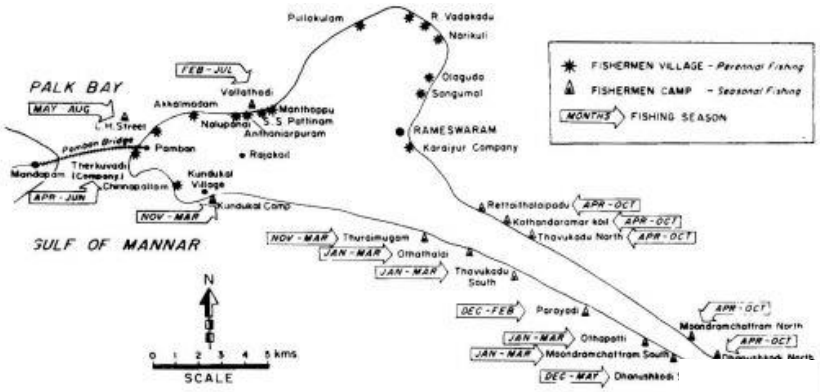
- Active Case Detection (ACD) of cases in the temporary fishermen camps and tracing them with the aid of 'MFC', for radical treatment
- All the pilgrim and tourists' homes - covered under the active surveillance, besides the residential localities.
- Vector control measures (using 'Paris green' in vector breeding habitats viz., coconut and casuarina garden pits, and indoor space spray with pyrethrum and peri-domestic application of ULV – Malathion fogging) were extended from villages to the fishermen camps in the year 1982 – 83.
- Based on the vector susceptibility test [Zonal Entomological Team of Tamil Nadu], use of insecticide - changed from Malathion (25% WP) to Deltamethrin (2.5% WP) in 1996, to Lambda-cyhalothrin (10% WP) in 2006, to Alpha-cypermethrin 5% WP in 2016.
- In the meanwhile, as per the new drug policy, especially for the treatment of *P. falciparum* cases, Artemisinin Combination Therapy was introduced in 2004 – 05.

The intensified activities by State NVBDCP following the above intervention approaches resulted in drastic reduction of malaria in 1984 [3063 cases (API: 18.0)], and this trend continued over the years as 1996: 1092 (18.0), 2006: 1175 (17.8), 2016:198 (2.6), 2017: 174 (2.2), 2018: 20 (0.2), 2019: 15 (0.19).

- **THE INDIGENOUS TRANSMISSION WAS NEGLIGIBLE IN 2020, AND THE STATE OF TAMIL NADU IS AIMING FOR MALARIA ELIMINATION IN 2023.**

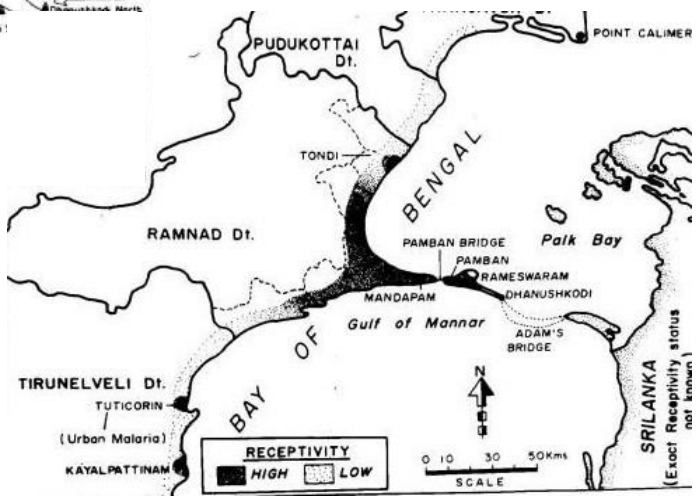


Migration pattern of fishermen between the coastal villages of mainland and the Rameswaram Island showing constant circulation of population critical for malaria endemicity in Rameswaram Island



Coastal villages and seasonal fishermen camps in Rameswaram Island

Receptivity status for malaria (risk of transmission) in Rameswaram Island and coastal mainland (intensity indicated byshading in black)



Vectorial role of *Anopheles culicifacies* Giles (Diptera: Culicidae) in malaria transmission in a tribal dominated district of Odisha State.

Dr. S. S. Sahu, ICMR-VCRC FS, Koraput (Odisha)

About 80 per cent of the population of India is living at risk of malaria with large concentration of cases related to forest-fringe, tribal and foothills hard to-reach areas[1]. Odisha State is highly endemic for malaria since many decades, accounts for nearly 23.0% of the disease burden and 14.2% of the total malaria deaths in the country during 2020[2]. Therefore, an accurate information on the role of malaria vectors in malaria transmission in the State is important for developing appropriate vector control strategy[3]. *Anopheles culicifacies* is the most widely distributed mosquito species across all part of the Odisha state[4]. It is highly necessary to elucidate the vectorial role of *An. culicifacies*; to formulate species-specific control strategy. Therefore, longitudinal studies were undertaken from 2017-2018 and 2019-2020 to explore the vectorial role of *An. culicifacies* in *P. falciparum* hyper-endemic districts, Koraput, Odisha State where LLIN is the main ongoing vector control intervention.

Koraput district is situated in the southernmost part of Odisha having 14 CHCs. Most of the villages in the district are located on hill-top, foothills or plains. The three prevailing seasons in the district are summer from March to June, rainy from July to October and winter from November to February. The district exhibits perennial malaria transmission since many decades[5,6]. More than 90% of the total malaria cases are caused by *Plasmodium falciparum*. Malaria incidence peaks during July to September and subsequently during November to December. The Annual Parasite Incidence (API) varied from 16.2 to 36.7, 26.4 to 32.4 and 2.4 to 4.6 during 2001-2010, 2011-2017 and 2018-2020, respectively (Source: CDMO & PHO Office, Koraput). The death due to cerebral malaria was common in the district. While, between 19 and 63 deaths were reported between 2001 and 2010, it was reduced to 0 to 9 during 2011-2020 (Source: CDMO & PHO Office, Koraput). *An. culicifacies* is abundant in the district[6,7]. *An. culicifacies*, prefers to breed in riverbed pools, terraced paddy fields and ponds[5]. The main strategy of malaria control programme in the district is by controlling the vectors. From 1953 onwards, IRS with DDT was the sole vector control intervention ongoing in the district. During 1990s, SPs were introduced in the district for IRS. Later from 2002 onwards, insecticide treated nets (ITNs) were introduced in many parts of the district. But due to operational limits like difficulty in re-treatment, ITNs was later withdrawn and from 2009, LLINs have been distributed in the district in a phased manner during 2017[8]; mass distribution of LLINs was carried out in the district to provide universal coverage. In this vector control changing scenario, the role of *An. culicifacies* in malaria transmission in a malaria hyper-endemic tribal dominated Koraput district of Odisha State is discussed below.

The PCR analysis results from the study conducted during 2017-2018 in Laxmipur CHC of Koraput district showed that the infection rate of *An. culicifacies* was 2.2%. A total of 657 *An. culicifacies* was subjected to PCR assay (Table 1). The results of subsequent study during 2019-2020 in same CHC showed that the infection rate of *An. culicifacies* was 2.4% among 320 mosquitoes processed (Table 1). Odisha State is highly malarious due to prevalence of supporting factors/ conditions[9]. *An. culicifacies* is the predominant species throughout Odisha[10]. This species acts as a malaria vector in all the regions wherever it occurs[11], which was not a fact in Koraput district[12,13]. There is some controversy about the vectorial role of *An. culicifacies* in transmission of malaria in eastern India[13]. Lot of works have been carried out to elucidate the role of *An. culicifacies* in malaria transmission in Odisha State during pre and post-DDT era. Studies carried out from 1937 to 1986 in Odisha State showed that *An. culicifacies* has no role in malaria transmission[14,15]. Subsequent studies conducted in Koraput district during 1987 and 1988 reported that out of 8995 *An. culicifacies* dissected, only 5 mosquitoes were found with only gut infections[12]. Extensive dissections made thereafter in different parts of Koraput district have shown no infections in

An. culicifacies in Jeypore zone and a low sporozoite rate of 0.09% in Malkangiri zone of erstwhile Koraput district[12]. All these studies conducted during pre and post-DDT era up to 1990s clearly showed that *An. culicifacies* played a minor or no role in transmission of malaria in Odisha State particularly in Koraput district.

Further studies conducted after introduction of SPs (2000) in the State showed the presence of high vector infection rates in this species. During 2004 to 2007 a study conducted in Angul district of Odisha State confirmed 1.8% sporozoite rate in *An. culicifacies*[16]. Similar observation was made in other districts of Odisha State during 2010-2011 and the sporozoite rate in *An. culicifacies* (n=438) was 1.39%[17]. Another study carried out in six districts of Odisha State showed that the sporozoite positive of *An. culicifacies* varied from 14.2% to 19.1%[18]. The finding of the current study is in agreement with the earlier studies conducted elsewhere in Odisha State after 2000.

All these studies conducted after introduction of synthetic pyrethroids (SPs) clearly showed that *An. culicifacies* which was earlier playing a supporting role in malaria transmission is now actively playing role. This may be due to the fact that *An. culicifacies* sibling species E has appeared in the State recently, which is an efficient vector[19]. The detection of sibling species E and presence of vector infection in *An. culicifacies* could be the reason for the persistence of high malaria incidences in the southern districts of Odisha[18]. In earlier studies (before 2000) conducted in Koraput district, *An. fluviatilis* was incriminated as a major malaria vector, whereas *An. culicifacies* played only a supporting role[13]. But gradually, due to the mass introduction of LLINs, the density of *An. fluviatilis* has drastically reduced[7] as it is susceptible to SPs and the density of *An. culicifacies* remained the same probably due to the development of resistance to SPs[7]. Eventually, this species has evolved as a major vector in the region.

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Table 1. The infection rate of *Anopheles culicifacies* in Koraput district with PCR

Test Particulars	2017-2018	2019-2020
No. of mosquitoes	657	320
No. of pools	52	33
No. of pool +ve	13	7
Pool positive rate (%)	25.0	21.2
Infection rate (%)	2.2	2.4
95% CI	1.2 to 3.7	1.1 to 4.7

Leishmaniasis: Current Situation in South India

Fathima PA, Harish K Shah, N. Pradeep Kumar, Ashwani Kumar and Prasanta Saini
ICMR-VCRC FS, Kerala & ICMR-VCRC, Puducherry

Introduction

Leishmaniasis is a vector borne disease which is mainly found in the tropical, subtropical regions of the world. It is caused by a protozoa parasite, the *Leishmania* which has more than 20 species. Over 90 sandfly species are known to transmit *Leishmania* parasites. Leishmaniasis cause different clinical manifestation in man. The most common manifestations are cutaneous leishmaniasis (CL) which causes skin sores, mucocutaneous leishmaniasis that (MCL) infect mucocutaneous parts of the body and visceral leishmaniasis (VL) which affects internal organs like spleen, liver and bone marrow. The World Health Organization (WHO) estimates that globally about 700 000 to 1 million and over 50,000 deaths of kala–azar every year. Over 90% of these cases are from seven countries viz. Bangladesh, Brazil, Ethiopia, India, Nepal, Sudan and South Sudan. It is transmitted to man through the inoculation of the promastigotes during blood meal by an infected female *Phlebotomines* (WHO 2021).

Owing to the reduction of reported number of cases of kala-azar, in the past decades, in the Indian sub-continent (Bangladesh, India and Nepal), the disease is targeted for elimination from this region (WHO 2016). India has already achieved a remarkable ten-fold reduction in annual kala-azar cases from 2007 to 2018. A target of reduction of annual incidence below 1 per 10,000 population at sub-district (block) level by 2020 has been adopted for elimination in India (NVBDCP 2018). The present article focuses on overview of current knowledge on Leishmaniasis in 21st century from the states Karnataka, Kerala, Tamil Nadu and Puducherry of Southern India. This disease is not recognized as a notifiable disease in these states.

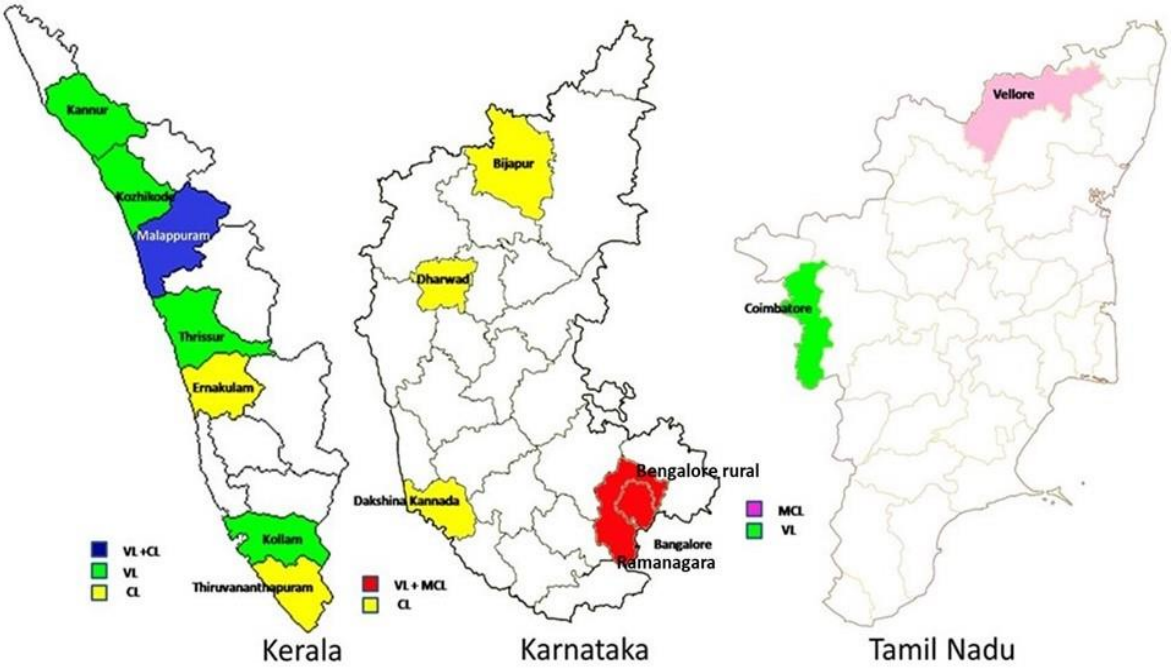
Epidemiology of Leishmaniasis in south India

As per 2019 data of NVBDCP, India contributed 20% of global burden of kala azar. Various clinical manifestations like most severe Visceral Leishmaniasis to mild Cutaneous Leishmaniasis are mostly recorded in remote areas, where health facilities are inadequate and people are living in poor sanitary condition. Among all age groups, young children are more prone to infection due to malnutrition and weak immune system.

In recent years, sporadic cases of Kala-azar have been reported from the poorly developed communities residing in Karnataka, Tamil Nadu, and Kerala. Typically, VL patients are presented with prolonged fever, massive weight loss, splenomegaly, hepatomegaly, anaemia, loss of appetite, malaise, pancytopenia, emaciation, anorexia, dark colouration of skin, abdominal pain, diarrhoea, cough etc. Whereas, CL causes itchy lesions, scars, and ulcers leading to disfiguration of skin, Diffused Cutaneous Leishmaniasis (DCL) presents with more scattered lesions resembling lepromatous leprosy and Mucocutaneous leishmaniasis affects mucous membranes. Post

Kala-azar Dermal Leishmaniasis (PKDL) is noticed among VL cured patients which increases the risk of parasite circulation.

Besides the endemic states of kala azar, sporadic cases of VL and CL are being reported from the state of Kerala mainly in the Western Ghats region. Tamil Nadu state was once a paradise of VL cases during the 1970s and considered to be endemic for Kala-azar. A retrospective study conducted in Tamil Nadu between 2008 to 2018 revealed 52 suspected cases of leishmaniasis with cutaneous, mucosal, and PKDL symptoms (Tharakan *et al.,* 2020). During 2019, an indigenous case of VL in a 10year old child was recorded from Coimbatore, Tamil Nadu (Bavas 2019). Unusual incidences of leishmaniasis were also reported from Karnataka. In 2016, MCL and VL have been reported in an immunocompetent person from the state of Karnataka. Four CL cases have been reported from this state during 2012-2017. Two imported cases of CL were reported in Kerala in 1988 and the first indigenous case of CL in the state was reported from Malappuram district after two years (Muhammed *et al*., 1990). Further 12 VL, 14 CL, and 1 DCL cases were reported from the Western Ghats regions of Kerala during 2003-2019.



District wise distribution of leishmaniasis cases reported from South India

The investigations by ICMR-VCRC revealed the prevalence of vector species *Phlebotomus argentipes,* transmitting *Leishmania donovani* the causative agent of leishmaniasis in this region. The living conditions of the tribal population also favoured the survival of these vectors providing optimum breeding, feeding, and resting habitats. In Kerala, the potential of *L. donovani* Zymodeme MON-37 strain for causing both cutaneous and visceral manifestations were identified (Kumar *et al*., 2015, Saini *et al.,*2020). The natural infection of the same parasites isolated from patients has been detected in field collected specimens of *P. argentipes*, shows its ability to spread CL and VL in the Western ghats region (Srinivasan *et al.,* 2016). In addition to this, the natural infection of *L.*

donovani obtained from domesticated dogs from southernmost Western Ghats suggest the possibility of zoonotic transmission of parasites among the tribals of this region (Jambulingam *et al.,* 2017).

Risk of Co-infections

Leishmania co-infection has emanated as a major complication in HIV and tuberculosis patients. The risk of acquiring VL is 100 times higher in HIV infected candidates. In India, the first case of VL-HIV co-infection was reported from Bihar and further observed from other parts of the country. Later, the incidence of DCL-HIV co-infection has been observed in Kerala and Karnataka, both are in Southern India and are non-endemic for VL and CL (Mehta *et al*., 2009, Mahesh *et al.,* 2012). A case of CL coexistence with leprosy caused by *Mycobacterium leprae* has been reported from Karnataka in 2015 (Patrao *et al.,* 2015). In many situations, the co-infection leads to misdiagnosis as it mimics various other clinical infections.

Diagnosis and treatment

In man infection due to *Leishmania* parasites can result in 3 main forms of disease i.e., CL, VL (kala–azar) and PKDL. Primary diagnosis of these diseases are based on clinical or clinical case definition (VL patient symptomatically persist history of prolonged fever (more than 2 weeks), along with splenomegaly and weight loss). Since, VL or kala-azar is deadly its diagnosis and treatment have been studied more and given most importance among others. Laboratory diagnostic techniques include serological and parasitological tests which help in confirmation of clinically suspected patient. Serological tests includes: - Rapid diagnostic test (RDT) i.e., rK39, Direct agglutination test (DAT), Immuno-fluorescent antibody test (IFAT), Indirect hemagglutination test (IHA), Enzyme Linked Immunosorbent Assay (ELISA), Complement Fixation test and Napierís Aldehyde test (developed by Napier and Das Gupta in 1931). At present, muti-marker molecular diagnosis for all type of leishmaniasis is most reliable approach up to strain level diagnosis of the causative agent. Whereas, parasitological tests includes, lymph node, splenic and bone marrow aspirate (Skin snip test in case of PKDL). The parasitological diagnosis still remains as the gold standard for the diagnosis of leishmaniasis. The grading of parasitaemia depends on the average density of the parasite detected by 10 X eyepiece and 100 X oil immersion lens.

Significant progress has been made in the development of drugs for VL. In the south Indian states, single dose of liposomal amphotericin B at the concentration of 10 mg/kg body weight in infusion is followed as the treatment regimen in Kerala. At present, other chemotherapeutical measures include Sodium Stibo gluconate (SSG) [20mg/kg body weight (maximum 850 mg/day) by single injection], amphotericin B (0.5 to 1 mg/kg daily or every alternate day for 15 days), and lipid associated amphotericin B [liposomal amphotericin B (ambisone), amphotericin B lipid complex, amphotericin B colloidal dispersion] 5 infusion of 3 mg/kg body wt. i.e. total 15 mg/kg body weight; miltefosine (100 mg/day for adults for 28 days), pentamidine (4 mg/kg intramuscularly on alternate days for 15-20 doses) and Paromomycin (Aminosidine) 15 mg/kg of body weight IM for 21 days. Among

these drugs only SSG is first line of treatment whereas, amphotericin-B and miltefosine are considered as second line of treatment (WHO 2021, WHO 1990, CDC 2020, RMRI Patna. 2021, NVBDCP 2021).

Prevention and control

Prevention and control of leishmaniasis requires a combination of intervention strategies as transmission occurs in a complex biological system involving epidemiological triad (host, vector and parasite along with environmental conditions). Prevention should aim at reducing the number of bites by wearing appropriate clothes (long sleeved) and repellents (ash, neem oil, commercial) during the evenings, especially during the dry season when kala–azar is mainly transmitted. Whereas, control in general mainly rely on diseases surveillance and chemotherapeutical measures, reducing man-vector contact, combined where feasible with vector control and, in some zoonotic foci, control of animal reservoirs. Vector control can be achieved by IRS (indoor residual spraying) by insecticides such as DDT, Malathion, synthetic pyrethroids etc., appropriate usage of LLINs, application of mud and lime plaster up to 1.22 meter in households of endemic foci (bioenvironmental measure) and genetically modified sandflies. Apart from this, early diagnosis and effective prompt treatment, effective disease surveillance, control of animal reservoir hosts and social mobilization and strengthening partnerships should also be given importance for prevention and control of leishmaniasis (WHO 2021, WHO 1990, CDC 2020, RMRI Patna 2021, NVBDCP 2021).

Conclusion

Increased man – vector contact could be a possible reason for the emergence of the disease in newer regions. The incidence of sporadic cases of leishmaniasis has to be considered in public health context to prevent emergence/re-emergence of infection mainly among the tribals and socially deprived populations. These new foci deserve special attention as they are not enough empowered for their needs. Proper awareness, periodical epidemiological and entomological inspections by public health authorities and necessary intervention measures could gradually eliminate further transmission of leishmaniasis in South India.

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Tick Borne Lyme Disease

Dr. K. Athisaya Mary, Senior Technical Officer, ICMR-VCRC, Puducherry

Lyme disease is classified as a zoonosis, transmitted to humans through the bite of infected blacklegged ticks *Ixodes scapularis* (Fig: 1) from a natural reservoirs such as deer, small mammals and birds. Lyme disease is not to be confused with lime disease which is associated with phytophotodermatitis, the most severe reaction, caused by the essential oil of the bergamot orange (*Citrus bergamia*). Lyme disease was identified in three towns in South-eastern Connecticut, United States in 1975 which gave the disease its popular name. This disease, is caused by the spirochete (Fig: 2) a corkscrew-shaped bacterium called *Borrelia burgdorferi* and the bacterium is transmitted to humans by the bite of infected ticks. Lyme is called "The Great Imitator," because its symptoms mimic many other diseases. It is also known as Borreliosis.

Vector and the reservoir hosts : Hard-bodied ticks of the genus *Ixodes* are the main vectors of Lyme disease. Of the various stages (Fig: 3) of the ticks, most infections are caused by ticks in the nymphal stage, because they are very small and thus may feed for long periods of time undetected. Although deer are the preferred hosts of adult deer ticks, and tick populations are much lesser in the absence of deer, ticks generally do not acquire Borrelia from deer, instead they obtain them from infected small mammals such as the white-footed mouse, and occasionally birds (Fig: 4). To contract Lyme disease, an infected deer tick must bite you. The bacteria enter your skin through the bite and eventually make their way into your bloodstream. In most cases, to transmit Lyme disease, a deer tick must be attached to a person for 36 to 48 hours.

The bacteria: Willy Burgdorfer (June 27, 1925 – November 17, 2014) was an American scientist born and educated in Basel, Switzerland, considered an international leader in the field of medical entomology. He discovered the bacterial pathogen that causes Lyme disease, a spirochete named *Borrelia burgdorferi* in his honour.

Clinical Symptoms: In Lyme disease the incubation period from infection to the onset of symptoms is usually one to two weeks. The disease shows various clinical manifestations (Fig: 5). The most common sign of infection is an expanding red rash, known as erythema migrans (EM) (Fig: 6), that appears at the site of the tick bite about a week after it occurred. Other early symptoms may include fever, headache and tiredness. If untreated, symptoms may include loss of ability to move one or both sides of the face, joint pains, severe headaches with neck stiffness, or heart palpitations, among others (Fig: 7). Rage is one of many mental health issues people with Lyme Disease face. A study on neuropsychiatric disease and treatment found that 68 percent of Lyme patients experienced explosive anger, homicidal thoughts, and/or suicidal thoughts.

Epidemiology : Lyme disease occurs regularly in Northern Hemisphere temperate regions. It is endemic in Africa particularly in Northern Africa (Morocco, Algeria, Egypt and Tunisia), East Africa (in Kenya), Asia (Japan, northwest China, Nepal, Thailand and far eastern Russia, Mongolia), Europe-central Europe (particularly in Slovenia and Austria) in southern Europe (Italy and Portugal) and in United Kingdom, North America (particularly in Canada, Mexico, United States) and South America (Brazil, Colombia and Bolivia).

History: The history of lyme disease, associating with vector, the symptoms etc., date backs from the year 1638 to 1970. In 1638 and again from 1663 to 1670, John Josselyn, observed infinite numbers of ticks hanging upon the bushes when he visited New England and found that would cleave to man's garments and eating the flesh of a man.

First report in India: Ixodes ticks are present in Himalayan region of India, and thus, there is a likelihood that Lyme disease may exist in our country. In 1989 Lyme disease was identified in a 14-year boy from Shimla reported by RK Patial et al., which was the first case of Lyme disease in India. In 2013 Lyme disease outbreak in Wayanad, Kerala was reported by K R Rajeev in human settlements inside the Wayanad Wildlife Sanctuary. Further in the year 2008 Surg Cmde AK Praharaj et al., reported Sero-positivity to *B. burgdorferi* in service personnel and their families from north eastern region of India comprising Arunachal Pradesh, Meghalaya, Manipur, Nagaland and Assam. Jairath V et al., reported Lyme disease in Rohtak, Haryana, India in the year 2014. Recently Babu K et al., reported a high seroprevalence of infection with *B. burgdorferi* in the forest workers and staff of Nagarahole and Bandipur forest ranges in South India for Lymes disease in the year 2020.

Diagnosis: Lyme disease is diagnosed based on symptoms. People with symptoms of early Lyme disease should have a total body skin examination for EM rashes. In some cases, when history, signs, and symptoms are strongly suggestive of early disseminated Lyme disease, empiric treatment may be started and re-evaluated as laboratory test results become available. EM rashes are often misdiagnosed as spider bites, cellulitis, or shingles. Facial palsy caused by Lyme disease (LDFP) is often misdiagnosed as Bell's palsy. Lyme disease may be misdiagnosed as multiple sclerosis, rheumatoid arthritis, fibromyalgia, chronic fatigue syndrome, lupus, Crohn's disease, HIV, or other autoimmune and neurodegenerative diseases. Detection of antibodies by ELISA, Polymerase Chain Reaction (PCR) have been developed to detect the disease. In Lyme carditis, electrocardiograms are used to evidence heart conduction abnormalities, while echocardiography may show myocardial dysfunction. Magnetic resonance imaging (MRI) and single-photon emission computed tomography (SPECT) are two of the tests that can identify abnormalities in the brain of a person affected with Lyme disease.

Treatment: Antibiotics are the primary treatment. Oral administration of doxycycline is widely recommended Doxycycline is contraindicated in children younger than eight years of age and women who are pregnant or breastfeeding. Alternatives to doxycycline are amoxicillin, cefuroxime axetil, and azithromycin. Physical therapy is recommended for adults after resolution of Lyme arthritis. People receiving treatment should be advised that reinfection is possible and how to prevent it.

Occupational exposure: Outdoor workers are at risk of Lyme disease if they work at sites harbouring the infected ticks. This includes construction, landscaping, forestry, brush clearing, land surveying, farming, railroad work, oil field work, utility line work, park or wildlife management.

Tick habitats: Ticks prefer moist, shaded locations in woodlands, shrubs, tall grasses and leaf litter or wood piles. Tick densities tend to be highest in woodlands, followed by unmaintained edges between woods and lawns, ornamental plants and perennial groundcover, and lawns. Activities associated with tick bites around residences include yard work, brush clearing, gardening, playing in the yard, and letting into the house dogs or cats that roam outside in woody or grassy areas. In parks, tick bites often happen while hiking or camping.

Prevention of tick bites: Soaking clothes, shoes, and bags with 0.5% permethrin solution and hanging them to dry before use. Permethrin is odourless and safe for humans but highly toxic to ticks. After crawling on permethrin-treated fabric for as few as 10–20 seconds, tick nymphs become irritated and fall off or die. Better protection can be achieved by tucking permethrin-treated trousers (pants) into treated socks and a treated long-sleeve shirt into the trousers so as to minimize gaps through which a tick might reach the wearer's skin. Light-coloured clothing may make it easier to see ticks and remove them before they bite. Military and outdoor workers' uniforms treated with permethrin have been found to reduce the number of bite cases by 80–95%. Permethrin protection lasts several weeks of wear and washings in customer-treated items and up to 70 washings for factory-treated items. Permethrin should not be used on human skin, in underwear's. The EPA recommends several tick repellents for use on exposed skin, including DEET, picaridin, IR3535 (a derivative of amino acid beta-alanine), oil of lemon eucalyptus (OLE, a natural compound) and OLE's active ingredient para-menthane-diol

(PMD). Clothes can be put into a hot dryer for 10 minutes to kill ticks. The following areas of the body should be checked especially carefully: armpits, between legs, back of knee, bellybutton, trunk, and in children's ears, neck and hair.

Tick removal by using tweezers: Attached ticks should be removed promptly. Risk of infection increases with time of attachment, CDC recommends inserting a fine-tipped tweezer between the skin and the tick, grasping very firmly, and pulling the closed tweezer straight away from the skin without twisting, jerking, squeezing or crushing the tick (Fig: 8). Wound and hands should then be cleaned with alcohol or soap and water. The tick may be disposed by placing it in a container with alcohol, sealed bag.

Reduction of host animals: By reducing the deer population on which the adult ticks depend for feeding and reproduction. Veterinary control of ticks of domestic animals, including livestock, by use of acaricides can contribute to reducing exposure of humans to ticks.

Preventive antibiotics: A single dose of doxycycline administered within the 72 hours after removal of the tick may reduce the risk of Lyme disease. It is not generally recommended for all people bitten, as development of infection is rare: about 50 bitten people would have to be treated this way to prevent one case of erythema migrans.

Society and culture: Urbanization and other anthropogenic factors can be implicated in the spread of Lyme disease to humans. In many areas, expansion of suburban neighbourhoods has led to gradual deforestation of surrounding wooded areas and increased border contact between humans and tick-dense areas. As a consequence of increased human contact with host and vector, the likelihood of transmission of the disease has greatly increased. Researchers are investigating possible links between global warming and the spread of vector-borne diseases, including Lyme disease:

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Fig. 1 Adult tick. Source: www.hackensackmeridian health.org

Fig. 2 *Borrelia* bacteria, the causative agent of Lyme disease, magnified. Source: Todar's online text book of bacteriology

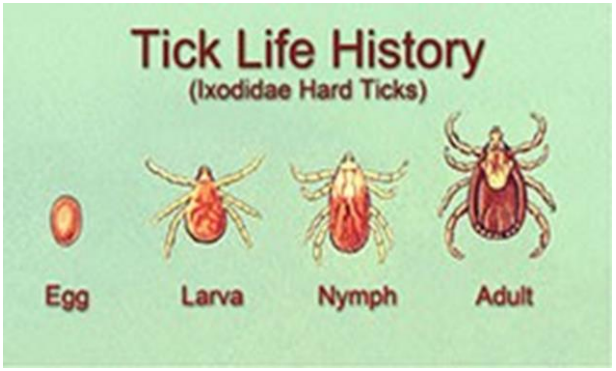


Fig. 3 Life stages of a tick. Source: extension.colostate.edu

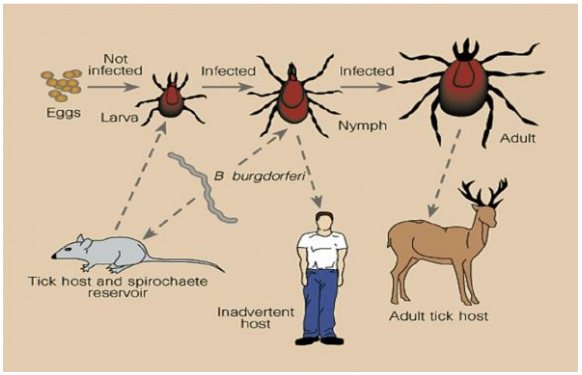


Fig. 4 Life cycle of the Ixodes ticks, vectors of lime borreliosis, reservoir hosts such as mice. Source: Research Gate

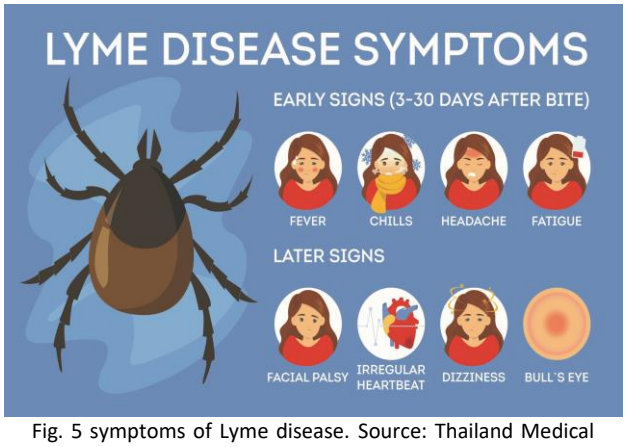


Fig. 5 symptoms of Lyme disease. Source: Thailand Medical news

Fig. 6. Erythematous patch with smooth surface and a papule in the centre of the lesion present over left upper arm of a 27-year-old housewife from Rohtak, Haryana, India.
Source: Jairath V *et al*., Indian J Dermatol Venereol Leprol 2014;80:320-323

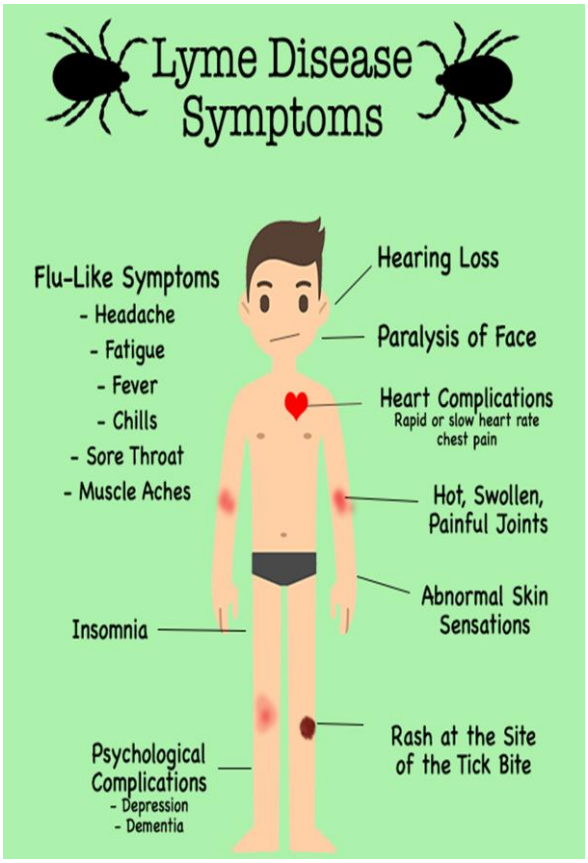


Fig. 7: symptoms of Lyme disease. Source: Thailand Medical news

Social Media and Communication Network

Swachhata Pakhwada activities

In accordance with the ICMR memorandum to celebrate Swachhata Pakwada (Cleanliness Fortnight) from 01.04.2021 to 15.04.2021, the ICMR-VCRC Hygiene Committee organized a programme to check the presence of mosquito breeding sites in Gorimedu area, Puducherry, if found to eliminate them. The VCRC Hygiene committee members & the Master of Public Health Entomology (MPHE) students and Twenty Police Personnel from Police Training School participated in Shramadan.

Matribhasha Diwas Celebrations

The Ministry of Human Resource Development (MHRD) celebrates 'Matribhasha Diwas' on February 21 across the country. On 21 Feb 2021, Vice President of India, Shri M. Venkaiah Naidu inaugurated a Webinar on the occasion of 'International Mother Language Day'. The Webinar on 'Fostering Multilingualism for Inclusion in Education and Society' was organised jointly by the Ministry of Education, Ministry of Culture and IGNCA.

Speaking at the inaugural session, the Vice President focused on five key sectors to promote the use of mother tongue. Apart from emphasizing the use of mother tongue in primary education, the other highlighted areas are the use of local languages. He also wanted gradual increase in the use of indigenous languages in higher and technical education. The final emphasis was on everyone to proudly and preferably use their mother tongue in their homes.

On this occasion, as per the directions of ICMR-VCRC Director, Dr. Ashwani Kumar, a three-member team including Dr. A.N. Shriram, Scientist C, Mr. Y. Srinivas Murty, Senior Technician and Dr. A. Krishna Kumari, Principal Technical Officer, in association with the HRD department headed by Dr. V. Vasuki, Scientist E organized the ICMR-VCRC Matribhasha Diwas celebrations involving the first and second year MPHE students, MPHE interns, Ph. D scholars, and VCRC staff members on 17.03.2021. The programme started on the importance of learning and promoting one's mother tongue and encouraged the staff and students to be proud of their mother tongue and do their best for its promotion.

After the inauguration and speeches, a recitation programme was conducted for interested students and staff to present songs, poetry, narrations, etc. in their respective mother tongue and explain the meaning of the recitation in English for the audience. Twenty participants, twelve students and eight staff members recited/sang/narrated /spoke in fourteen different languages including Sanskrit, Malayalam, Tamil, Telugu, Kannada, Oriya, Jessary, Bhojpuri, Assamese, Badaga, Marathi, Urdu, Hindi and Punjabi.

On 19.03.2021, ICMR-VCRC Director, Dr, Ashwani Kumar, presented participation certificates to all the participants, during a special session arranged in connection with a guest lecture by Dr. K. Murugan, Registrar in-charge and HOD of Zoology, Bharathiar University, Coimbatore. On this occasion, Dr. Ashwani Kumar gave a short speech in Punjabi about the importance of promoting ones matribhasha and Dr. Ritu Niranjan Scientist C, recited a, Mushaira. The Mathribhasha Diwas 2021 celebrations in VCRC suggest a bright future for Matribhashas in the years to come.

Matribhasha Diwas Celebrations 2021







Tamil

Marathi

Bhojpuri

Jessary

Kannada

Assamese

Malayalam

#ICMR-VCRC/CU/MD/SrinivasMurty/March 2021

MATRIBHASHA DIWAS CELEBRATIONS 2021


Kannada

Badaga

Oriya

Telugu

Telugu

Urdu

Tamil

Malayalam

Sanskrit

#ICMR-VCRC/CU/MD/SrinivasMurty/March 2021

Matribhasha Diwas Celebrations 2021– Prize distribution

List of Participants in Matribasha Diwas Celebrations

Name	Language	Name	Language
Bhagyasree Bora, Ph.D Scholar	Assamese	Naveena Mable Frances, M. Sc,2nd year	Malayalam
Harish Kumar Shah, M. Sc Intern	Bhojpuri	Shrikanth Joshi, M. Sc 2nd year	Marathi
Sabir Ali, M. Sc 2nd year	Jessary	Pavithra, M. Sc 1st year	Tamil
Georgina Paarren Ritu, M. Sc 1st year	Kannada	Siri Chandana, Project student	Telugu
Vibina, M. Sc 2nd year	Malayalam	D. Kavyasri, Ph.D Scholar	Telugu
Rehana, M. Sc 2nd year	Urdu	Dr. Smrutidhara Dash, TO	Oriya
Ms. Hemalakshmy Ph. D Scholar	Tamil	Dr. Philip Raj Abraham, Scientist B	Kannada
Mr.Y. Srinivas Murty, Sr. Technician 3	Sanskrit	Dr. K. Gunasekaran, Sr. Consultant	Tamil
Mr. H. Jayaprakash, TO, B	Badaga	Mr. P.M. Azad, TO, B	Malayalam
Dr. Rituraj Niranjan, Scientist C	Hindi	Dr. Ashwani Kumar, Director	Punjabi

Day Care Centre

A day care centre for children of employees was inaugurated at centre's campus by the Director, Dr. Ashwani Kumar on 08.03.2021. The Child care centre was opened to support the health, education and entertainment of young children. Toys are kept readily accessible, cots and cribs are provided for rest time and re-frigerators and tables are there for food storage. A care taker has been arranged to look-after the young children for their safety during office hours. This is a welcome move from the council.

ICMR-VCRC and Bharathiar University Collaboration

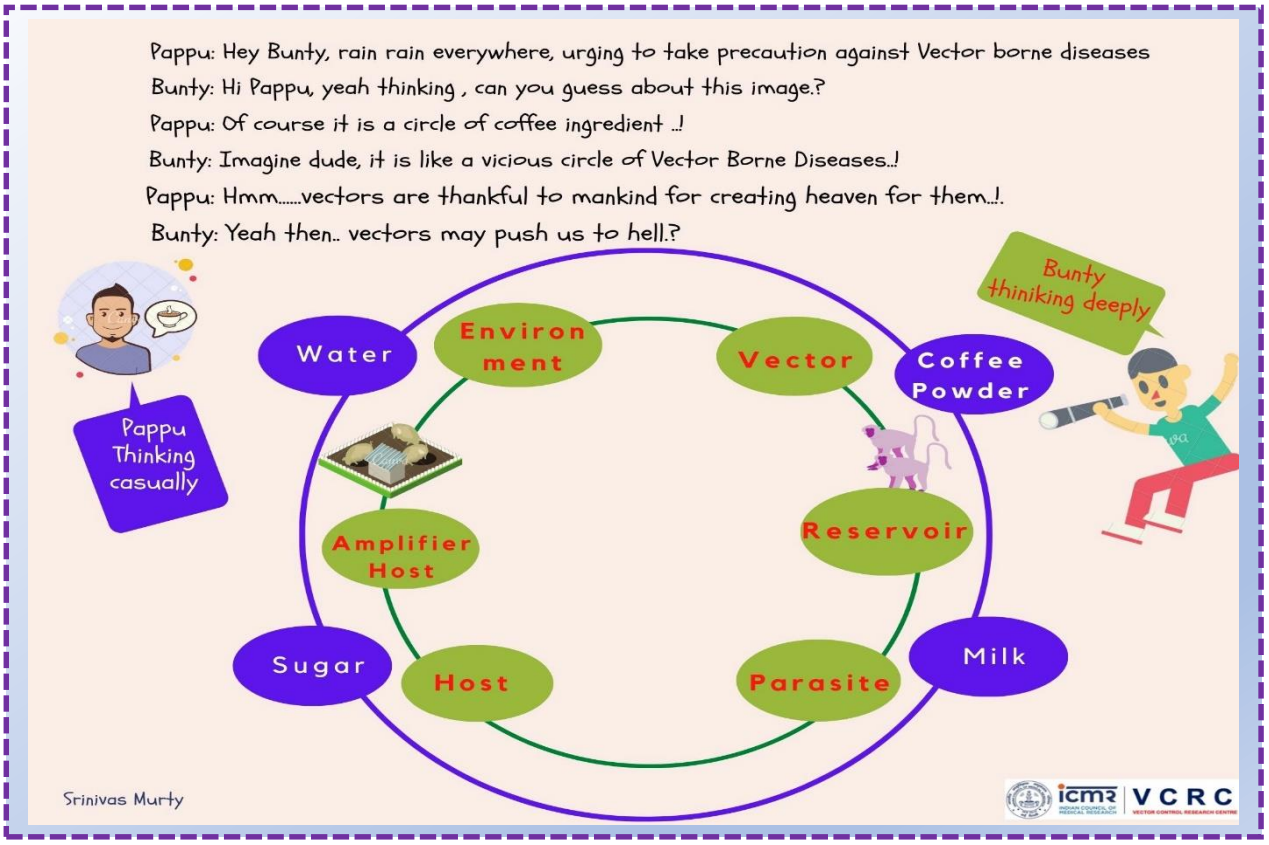
A Research collaborative meeting was held at Puducherry on 8th February 2021 between Bharathiar University, Coimbatore, Tamilnadu and ICMR-VCRC, Puducherry where the Vice chancellor Prof. P. Kaliraj, the Registrar Prof. K. Murugan and Professors of Bharathiar University interacted with and Director, Dr. Ashwani Kumar and Scientists of ICMR-VCRC, Puducherry for exchange of Post graduate students and initiate new collaborative studies and enrolling joint Ph.D students.

ICMR-VCRC and Sri Balaji Vidyapeeth University Collaboration

A research collaborative meeting was held for student exchange programme on artificial intelligence on Vector Borne Diseases and Technology transfer between Sri Balaji Vidyapeeth University and ICMR-VCRC, Puducherry. Prof. S. C. Parija, Vice Chancellor, Sri Balaji Vidyapeeth University along with Scientist of the centre participated.

Brain storming meeting on Scrub typhus

A collaborative brainstorming session between Scientists, ICMR-VCRC, Puducherry and Experts from French Institute of Pondicherry (FIP), Puducherry on Scrub typhus was held on 7th April, 2021.



COVID-19 testing facilities during the second wave in 2021

Although the primary mission of VCRC is prevention and control/elimination of Vector Borne Diseases, the institute extended its active support to the UT Govt. Health Services by testing COVID-19 samples under the umbrella of ICMR.

Like the first wave during the previous year, the centre has rendered contributions by providing COVID-19 testing facilities to the State Government of Puducherry during the second wave of COVID-19. The testing was resumed from 3rd May, 2021 to till date, 31st July, 2021 a total of 15,374 samples were tested. The centre has continued the facility of testing from then on.

A workshop on Introduction to Genetic Data & Analysis, Vector Biology and Genetics at Madurai Field Station

A training on "Vector Biology and Genetics" for M.Sc. & PhD students on 15 & 16th March 2021 was held at ICMR-VCRC Field Station, Madurai, Tamil Nadu. The programme was sponsored by SERB-DST under early carrier research award scheme. The VCRC scientists provided hands on training to the participants from colleges, universities and research institutes. On 22nd & 23rd March, 2021 a work-shop was organised on "Introduction to Genetic Data Analysis" for College faculty, sponsored by SERB by ICMR-VCRC Madurai Field Station lead by Dr Bhavana Gupta Scientist-C.

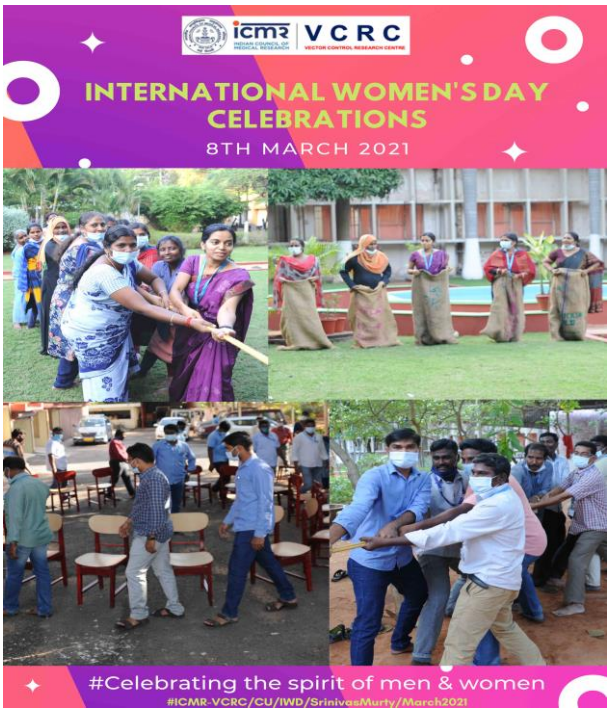
Inauguration session

Diabetes Awareness & Screening Camp

Diabetes awareness and screening camp was conducted on 18th March 2021. The Doctors and Technicians from Mohan Diabetes Centre, Puducherry screened all the employees of the centre.

International Women's Day Celebrations

International Women's day was celebrated on 8th March 2021 at centre's premise and its field stations. A guest lecture and various competitions were held during the day. Dr. Ashwani Kumar, Director praised the contributions of women in science and research. He felicitated two women scientists for their outstanding contributions in their respective areas of research.



DR. KOTHANDAPANI BALARAMAN – A TRIBUTE TO AN INVENTOR

By Dr. S. L. Hoti, Emeritus Scientist, ICMR-VCRC, Puducherry

Dr. K. Balaraman, a pioneer of biological control of disease vectors in India, was born to Sri Kodandapani and Mrs Puvanambal, in a family of humble farmers, residing in a remote village, Vinayagampattu, near Puducherry (formerly Pondicherry) on 10th Dec 1946. He had his schooling from government school in Seshanur and pre-university education from the famous Pachaiyypan College, Chennai. He went to pursue his graduation in agriculture in Annamalai University, Chidambaram and then for Post-graduate degree in the prestigious Tamil Nadu Agriculture University, Coimbatore, one of the premier agricultural institutions in the country. He pursued his PhD in the same university in the field of plant pathology and completed it in the year 1978. He spent 8yrs (1970-1978) in TNAU actively involving himself both in research and teaching.

He joined the Vector Control Research Centre, Puducherry on 31.03.1978 as Asst. Research Officer and shouldered the responsibility of establishing 'Insect pathogens laboratory' in a double bed room two floor house in Lawspet, Pondicherry, helped by Mr. Bheema Rao, Technical Officer, Mr Soni and others, and explored the mosquito pathogenic potential of a scores of biological agents. With the joining of Dr A. M. Manonmani, larvicidal bacilli, *B. alvei* and *B. brevis* were isolated in the year 1979. I was fortunate to join the group in 1980 and we intensified the search for a more patent mosquitocidal agent. In the process a bacterium, *Bacillus thuringiensis* var. *israelensis* VCRC B17 was isolated in 1980, which showed high mosquito larvicidal activity against a variety of mosquito larvae and safety to non-target organisms. Its activity was rated by Dr De Barjac, Institute Pasteur, Paris and Prof. Meer Mulla as 'Five star', with mosquito larval toxicity comparable to WHO approved strain ONR 60A. Dr Balaraman, did not lose the time in the further development of the agent. Over next 15 years, he led the team as a commander and several studies pertaining to bioprocess technology, formulation, safety and field efficacy were conducted. A state of art product was thus developed and a patent was filed. The product is currently licensed to 20 commercial firms, and the PSU giant, Hindustan Insecticide Ltd., New Delhi has expressed intent to seek license of this VCRC technology recently. This is a landmark achievement of the VCRC scientists led by Dr. Balaraman. Parallely, he led the development of several other products viz., *Bacillus sphaericus*, Thrombinase, Cyclosporine and a few others. Efforts are on to realize his long cherished dream of commercializing Thrombinase and Cyclosporine.

It is noteworthy that Dr. Balaraman was an awardee of WHO Fellowship Programme for Training in Biological Control of Vectors in London School of Hygiene & Tropical Medicine & Liverpool School of Tropical Medicine and Czechoslovakia (Czech Academy of Sciences) 1982 and WHO Fellowship Programme for Management of Product Development, Rules//Procedures for Certification of Products, Drugs, Vaccines, etc. in Centres for Disease Control, Atlanta, USA, 1998. He served as a member of WHO committees on the development of biocontrol agents for mosquitoes.

Apart from these achievements, his another major contribution was to the human resource development in the field medical entomology. He was instrumental in initiating the M.Sc. Medical Entomology course in VCRC, a first of its kind in the whole world and ran it successfully for 10 years. He guided 9 PhD students and I was fortunate and privileged to be his first student. He always took good care and guided his students as a father figure. Also, he mentored many other scientists of VCRC who are playing important roles in national and international disease control programmes. I will be failing in my duty if don't mention about his administrative skills; he supported

both Dr P. K. Rajagopalan and Dr. P. K. Das, former Directors of VCRC in the best possible way and especially in difficult times and crucial administrative matters, much needed in running a large organization such as VCRC.

Dr. Balaraman was a silent worker, and excellent and meticulous planner, and did not delay any action that needed to be taken. I recollect Dr P. K. Rajagopalan, a greatest Medical entomologist the country has ever produced and quote 'Balaraman never allows grass to grow under his carpet'. Hence, no further testimony is needed for his commitment, sincerity to his profession and hard work. The best part of him was that he worked at bench and the successful development Cyclopsorine technology is an example, and also getting into the dirty waters for field trials, which should be emulated by the young scientists of the present day. Successes of such dimension never come by observation and supervision, but only by soiling one's own hands. He retired in the year 2006 (Photo Below), after an illustrious career spanning 36 years.

He was leading a peaceful life post-retirement, spending useful time with his children and grandchildren, yet helping the translational research activities of the VCRC until recently. It is unfortunate that the global COVID 19 pandemic did not spare him and he succumbed to it in the late night of 22nd May 2021. He visited several times VCRC before his death in the recent times in connection with Bti (B-17) commercialization and met and interacted with Dr Ashwani Kumar, Director, ICMR-VCRC and other Scientists including me. He is survived by the devoted wife Mrs. B. Sivasankary, son B. Premkumar, daughter B. Vittyavady, and grandchildren with whom he was so affectionate. In his death, the Indian science has lost a great inventor, scientist and a teacher. He will always be remembered by his colleagues, admirers and a large number of students who had the privilege of knowing and working with him.

You will be missed Dr. Balaraman

Superannuations!

During the period from January to June 2021, Dr. R L J De Britto, Scientist F, Dr. V. Vasuki, Scientist E, Dr. B. Nanda, Scientist C, Dr. G. Prabhakaran Principal Technical Officer and Dr. A. Krishnakumari, Principal Technical Officer, Mr. R. Satyanarayan, Lab Assistant-1, Mr. Selvam, Technican-1, Mrs. Rajalakshmi, MTS have superannuated. The Director and Staff extended their good wishes for a happy retired life.

Dr. R L J De Britto, Scientist F

Dr. V. Vasuki, Scientist E

Dr. B. Nanda, Scientist C

Dr. G. Prabhakaran, Principal Technical Officer

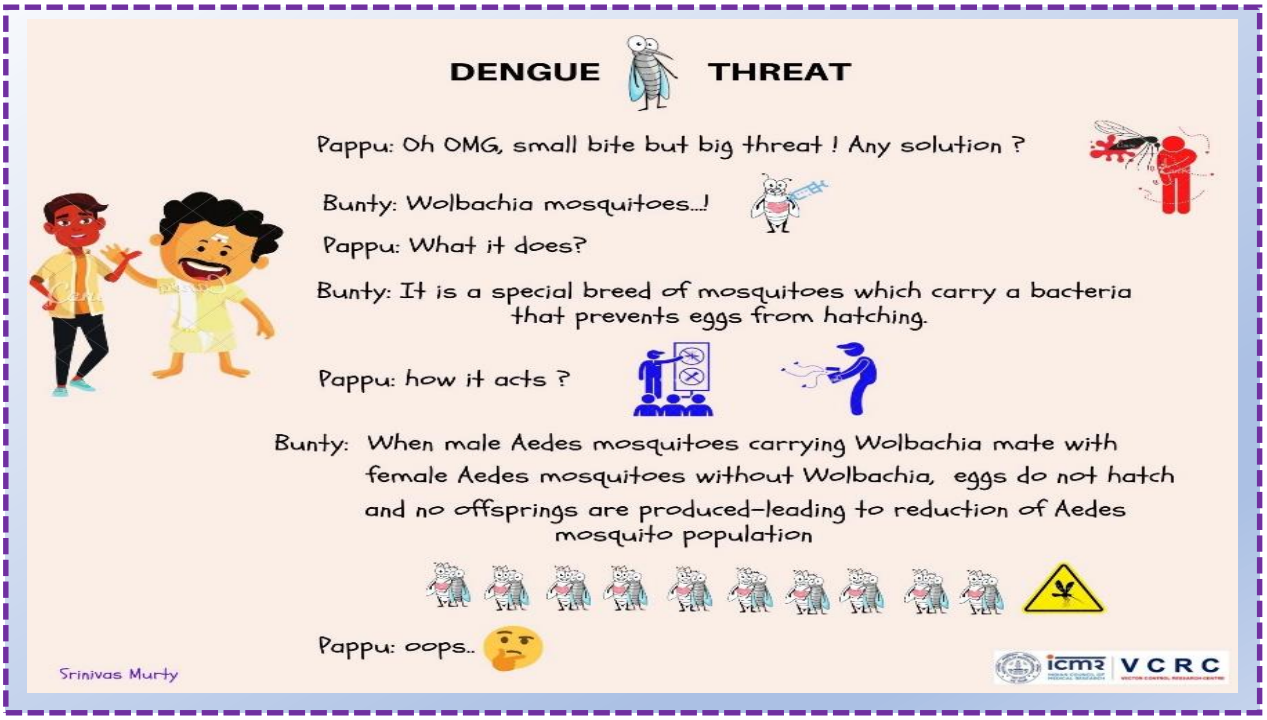
Dr. A. Krishnakumari, Principal Technical Officer

Meetings and Events

Sl.No.	Date	Event	Section/Scientist
01	20.01.2021 & 21.01.2021	Meeting to discuss on LF research in the context LF elimination in India at RMRC, Port Blair.	Dr. Ashwani Kumar, Director Dr. S. Sabesan, Sr. Consultant Dr. K. Krishnamoorthy, Sr. Consultant Dr. S. Subramanian, Sr. Consultant Dr. A. N. Shriram, Scientist-C
02	25.01.2021 to 30.01.2021	Webinar on Health Science of Kerala Science Congress, on 25th to 30th January 2021 and presented a paper on the topic entitled "Epidemiological Investigations on Autochthonous Leishmaniasis in Western Ghats of Kerala State".	Dr. Prasanta Saini, Scientist-B, ICMR-VCRC FS, Kottayam, Kerala
03	26.01.2021	Republic Day Celebrations were marked by flag hoisting. During the occasion, scientists and staff were honoured. Flag hosting ceremony was carried out in the Field Stations of Kottayam, Kerala, Koraput, Odisha and Madurai, Tamil Nadu.	Dr. Ashwani Kumar, Director Dr. Paramasivan, Scientist-F Dr. S. S. Sahu, Scientist-F Dr. Prasanta Saini, Scientist-B
04	28.01.2021	Webinar on Ending NTDs together towards 2030.	Dr. Bhavna Gupta, Scientist C, ICMR-VCRC FS, Madurai, Tamil Nadu.
05	02.02.2021	A research collaborative meeting was held for student exchange programme on artificial intelligence on Vector Borne Diseases and Technology transfer between Sri Balaji Vidyapeeth University and ICMR-VCRC, Puducherry. Prof. S.C. Parija, Vice Chancellor, Sri Balaji Vidyapeeth University along with Scientists of the centre.	Dr. Ashwani Kumar Prof. S. C. Parija Prof. S. Sabesan Dr S. L. Hoti and Scientists
06	05.02.2021	VMC meeting of Kendriya Vidyalaya, Koraput on academic matters, administrative matters, financial matters, current event in the Vidyalaya, any other matters with permission of the chair	Dr. S. S. Sahu, Scientist F, ICMR-VCRC FS, Koraput
07	08.02.2021	A research collaborative meeting was held between Bharathiar University, Coimbatore, Tamil Nadu and ICMR-VCRC, Puducherry. The Vice Chancellor, Registrar and Professors of Bharathiar University interacted with Director and Scientist of ICMR-VCRC, Puducherry	Dr. Ashwani Kumar, Director Prof. P. Kaliraj, VC, Bharathiar University, Coimbatore, Professor of BU and Scientists VCRC
08	13.02.2021	Virtual Meeting under DG, ICMR of Revenue Generation Plan throughout the ICMR	Dr. Ashwani Kumar, Director
09	19.02.2021	41st Scientific Advisory Committee (SAC) Meeting of ICMR-National Institute of Malaria Research, New Delhi	Dr. Ashwani Kumar, Director
10	24.02.2021	Signing of MoU with Sri Balaji Vidyapeeth University and ICMR-VCRC at Mahatma Gandhi Medical College and Research Institute, Puducherry	Dr. Ashwani Kumar, Director
11	25.02.2021	Institutional Animal Ethics Committee meeting through online platform	Dr. Ashwani Kumar, Director
12	01.03.2021	Delivered guest lecture on National Science Day 2021 at Bharathiar University, Coimbatore	Dr. Ashwani Kumar, Director
13	08.03.2021	International Women's Day Celebrations held at ICMR-VCRC, Puducherry Campus and its Field Stations in Kottayam, Madurai and Koraput where women scientists were felicitated.	Dr. Ashwani Kumar, Director Dr. Paramasivan, Scientist-F Dr. S. S. Sahu, Scientist-F Dr. Prasanta Saini, Scientist-B
14	08.03.2021	Day Care Centre for Children of the employees was inaugurated at the centre's campus.	Dr. Ashwani Kumar, Director
15	15.03.2021 to 16.03.2021	Inaugurated SERB sponsored Workshop on "Introduction to Genetic Data Analysis" held at ICMR-VCRC Field Station, Madurai	Dr. Ashwani Kumar, Director
16	15.03.2021 to 16.03.2021	SERB sponsored training workshop was organized on "Vector Biology and Genetics" for M.Sc. & Ph.D students.	Dr. Paramasivan, Scientist-F, Scientists and Technical Officers of ICMR-VCRC FS, Madurai, Tamil Nadu.
17	17.03.2021	Meeting with DG, ICMR regarding M.Sc. Public Health Entomology Course and Technology transfer	Dr. Ashwani Kumar, Director
18	17.03.2021	Matribhasha Diwas was celebrated to the importance of learning and promoting one's mother tongue. Staff members and M.Sc. PHE students recited/sung/narrated /spoke in fourteen different languages.	Staff, M.Sc. PHE students and Ph.D scholars of ICMR-VCRC, Puducherry

19	18.03.2021	Diabetes Awareness Screening Camp conducted at ICMR-VCRC campus. The Doctors and Technicians from Mohan Diabetes Centre, Puducherry screened all the employees of ICMR-VCRC, Puducherry	ICMR-VCRC, Puducherry Mohan Diabetes Centre, Puducherry
20	18.03.2021 to 19.03.2021	A training programme at ICMR- VCRC Field Station Kottayam for the Post Graduate students, Department of Community medicine, Govt. Medical College, Thiruvananthapuram on "Current scenario and advanced research in the field of vector control".	Dr. Prasanta Saini, Scientist B, ICMR-VCRC FS, Kottayam, Kerala
21	22.03.2021 to 23.03.2021	Inaugurated SERB sponsored Workshop on "Introduction to Genetic Data Analysis" organized by ICMR-VCRC Field Station, Madurai	Dr. Ashwani Kumar, Director
22	22.03.2021 to 23.03.2021	SERB sponsored workshop was organized on "Introduction to Genetic Data Analysis" for College faculty.	Dr. Paramasivan, Scientist-F, Scientists and Technical Officers of ICMR-VCRC FS, Madurai, Tamil Nadu.
23	31.03.2021	Attended as a member in the selection committee meeting for filling up the Administrative posts in ICMR held at ICMR, Delhi	Dr. Ashwani Kumar, Director
24	31.03.2021	Swachhta activity was conducted by providing free mask and soaps to Narikurava community at Gypsy Colony, Puducherry by ICMR-VCRC Hygiene Committee in association with Samugam Trust, Puducherry	Members, ICMR-VCRC Hygiene Committee, Puducherry
25	07.04.2021	Brainstorming Session on Scrub typhus: A collaborative session by the ICMR – VCRC & IFP, Puducherry	Dr. Ashwani Kumar, Director and Scientist of ICMR-VCRC, Puducherry & Experts from French Institute of Pondicherry
26	08.04.2021	Institutional Bio Safety Committee meeting through online platform	Dr. Ashwani Kumar, Director
27	10.04.2021	SAC-2020 Meeting of ICMR-RMRIMS, Patna	Dr. Ashwani Kumar, Director
28	10.04.2021	Members, ICMR-VCRC Hygiene Committee, Puducherry, M.Sc PHE students and Police personnel from Police Training School, Gorimedu, Puducherry participated in Swachhta Pakhwada fortnight week programme. The clogged drains supporting mosquito breeding sites in the area were cleared and cleaned.	Members, ICMR-VCRC Hygiene Committee, Puducherry
29	16.04.2021 & 22.04.2021	First Technical Specification Committee (TSC) meeting (virtual) to review/finalize technical specifications of LLINs for Vector Borne Disease under the Chairmanship of Principal Advisor (PKS), Dte. GHS, MoH&FW, New Delhi.	Dr. Ashwani Kumar, Director
30	22.04.2021	Second Technical Specification Committee (TSC) meeting (virtual) to finalize technical specifications of LLINs for Vector Borne Disease under the Chairmanship of Principal Advisor (PKS), Dte. GHS, MoH&FW, New Delhi.	Dr. Ashwani Kumar, Director
31	22.04.2021	Participated in the interactive meeting of the researchers Prawin Kumar and academician Seema Mundoli from Azim Premji University on the occasion of Earth day 2021 on the *Paraechinus nudiventris* popularly known as Madras Hedgehog on 22nd April, 2021.	Dr. Philip Samuel, Scientist-C, ICMR-VCRC FS, Madurai, Tamil Nadu.
32	26.04.2021	Attended a virtual mini-symposium of the International Union of Biological Sciences (IUBS) and International Society of Zoological Sciences (ISZS) Zoonotic Diseases convened by working group and 12th International Symposium of Integrative Zoology ISZS Secretariat and Integrative Zoology by Editorial Office on Zoonotic Disease on 26 April 2021 conducted to promote integrative studies on zoonotic diseases among scientists of different disciplines, so as to reveal the transmission pattern and dynamic of key zoonotic diseases which are imposing a high threat to humans.	Dr. Philip Samuel, Scientist-C, ICMR-VCRC FS, Madurai, Tamil Nadu.
33	27.04.2021	Expert Group meeting under the Chairmanship of Dr B S Das to review the study entitled "Demonstration of malaria elimination in the predominantly tribal population inhabited by Nancowry group of Islands in A&N islands". It is being led by RMRC, Port Blair and supported by VCRC, Puducherry and NIMR, Delhi.	Dr. Ashwani Kumar, Director
34	27.04.2021	Institutional Human Ethics Committee Meeting of ICMR-VCRC through online platform	Dr. Ashwani Kumar, Director
35	28.04.2021	Virtual participation in the district level technical task force committee meeting for malaria elimination & prevention of other vector Borne diseases.	Dr. S. S. Sahu, Scientist F, ICMR-VCRC FS, Koraput

36	30.04.2021	Webinar on India Patents Act on 30th April, 2021	Dr. Prasanta Saini, Scientist - B, ICMR-VCRC FS, Kottayam, Kerala
37	05.05.2021	Video conference meeting with DG, ICMR in connection with COVID19 pandemic situation	Dr. Ashwani Kumar, Director
38	05.05.2021	Participated in the International Centre Goa (ICG's) discussion forum on "Pandemics: Past, Present, Future" with Thomas Abraham, Honorary Associate Professor, University of Hong Kong and Dr. Chinmay Tumbe, IIM-Ahmedabad on Wednesday, 5th May 2021.	Dr. Philip Samuel, Scientist-C, ICMR-VCRC FS, Madurai, Tamil Nadu.
39	16.05.2021	Observation of National Dengue Day (online platform)	Mr. Md. Mustafa Baig, Sr. Technical Officer, ICMR-VCRC FS, Koraput
40	19.05.2021	Zoom meeting on Mid-term evaluation of the UNIDO-GEF DDT Alternative project related to transfer of technology for production of Bt-based larvacide with Stake holders	Dr. Ashwani Kumar, Director
41	27.05.2021	Webinar on One health and antimicrobial resistance organized by Centre for Disease Dynamics, Economics Policy (CDDEP), Washington	Dr. Ashwani Kumar, Director
42	01.06.2021	Meeting with DG, ICMR through video conference regarding the draft guidelines on engagement of project human resources	Dr. Ashwani Kumar, Director
43	02.06.2021	Technical support meeting for discussing the sample size of block level activities for Lymphatic Filariasis Programme via online platform with NVBDCP, Delhi	Dr. Ashwani Kumar, Director
44	03.06.2021	NIPGR-webinar on Computational Biology & Bioinformatics	Dr. Bhavana Gupta, Scientist C, ICMR-VCRC FS, Madurai, Tamil Nadu.
45	04.06.2021	Meeting with DG, ICMR regarding COVID19 Public Health Issues	Dr. Ashwani Kumar, Director
46	08.06.2021	Meeting with the Head, P&SM Dept., JIPMER regarding Indian Public Health Association membership and future IPHA conferences	Dr. Ashwani Kumar, Director
47	11.06.2021	M&E discussion for the new LF guidelines – India.	Dr. Ashwani Kumar, Director Dr. Nupur Roy, NVBDCP Dr Chhavi Joshi Pant.
48	17.06.2021	Meeting with Bharathiar University regarding collaboration through Virtual platform	Dr. Ashwani Kumar, Director
49	21.06.2021	Lecture series on infectious Diseases: ICMR-NIMR and MERA-India on 21st June, 2021	Dr. Bhavana Gupta, Scientist C, ICMR-VCRC FS, Madurai, Tamil Nadu.
50	30.06.2021	Meeting with ACSIR regarding academic collaboration through Video conference.	Dr. Ashwani Kumar, Director



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See Rule 8

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I, Dr. Ashwani Kumar, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Date: 01.07.2021

Ashwani Kumar
Signature of the Publisher