

Role of Laboratory in the Battle Against TB



Introduction

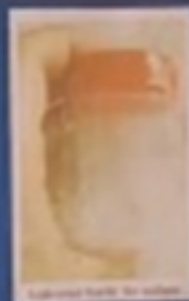
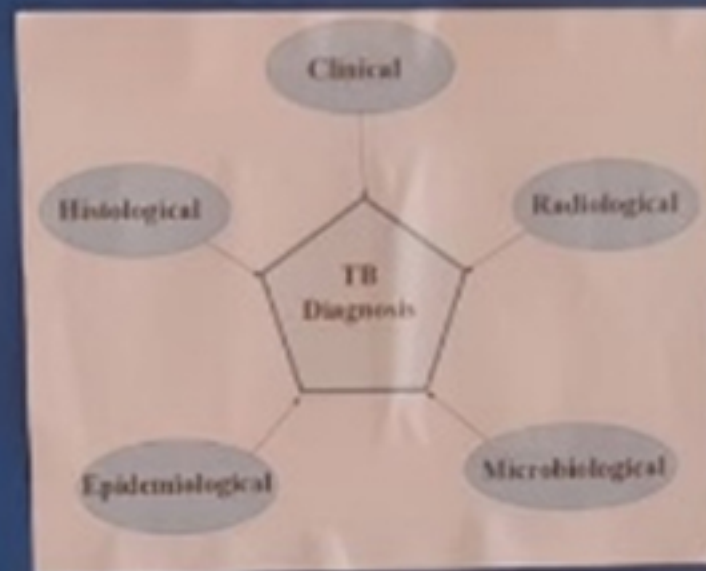
- TB is caused by the bacillus *Mycobacterium tuberculosis*
- TB commonly affects the lungs but can also affect any other organs

Specimens for microscopy, culture & GeneXpert

- Sputum
- Body fluids (CSF, pleural fluid, pericardial fluid, synovial fluid, peritoneal fluid, blood, pus and bone marrow)
- Pleural effusion: pleural biopsy
- Urine: Excretion of TB bacilli is intermittent, three consecutive early-morning midstream specimens must be collected: 20-50 ml
- ET secretion/ bronchial wash: minimum 10-25 ml
- BAL: minimum 20-50 ml
- Gastric aspirate from children: (early morning) added 100mg of sodium bicarbonate

Method used in diagnosis of *Mycobacterium tuberculosis*

- Microscopy
- Culture
- Nucleic acid amplification tests
- Rapid tests
- Drug susceptibility testing
- Screening



Molecular tests

Gene Xpert (automated nucleic acid amplification test)	Truenat TB test	Line Probe Assay
• Early detection of TB and resistance to rifampicin • Takes around 2 hours • Very little technical training required • Most sensitive	• Mass RT-PCR device • Can detect rifampicin resistance and isoniazid resistance • Portable, rapid	• Can detect Resistance to RIF, Isoniazid, Fluoroquinolones, Injectable drugs • Can detect MDR-TB, TB • Turnaround time 1-2 days



TB culture

Solid culture method

- 3-7 weeks for culture positivity (LJ)



Liquid culture method

- 1-2 weeks for culture positivity
- Higher sensitivity
- Several commercially developed automated systems

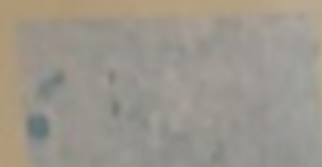


fluorescent growth indicator tube (FGIT)

Sewer Microscopy

Bright field microscopy

- Staining by Ziehl-Neelsen method
- Using light microscope



Using Ziehl-Neelsen stain, where with a slightly beaded or irregular edge

Fluorescence microscopy

- Staining with auramine
- Using fluorescent microscope
- More sensitive
- Requires trained technicians



Smaller, longer, yellow fluorescent rods, standing out clearly against a dark background

Laboratory diagnosis method	Advantages	Disadvantages
Direct smear examination	• Rapid and low cost • Identifies infectious pathogens • Used to monitor response to therapy	• Low sensitivity (needs 10000 organisms/ml to become positive) • Unable to differentiate between species of <i>Mycobacterium</i>
Ziehl-Neelsen	• sensitive (detects 10-100 viable organisms) • provides opportunity for speciation, strain identification and anti-TB sensitivity	• Takes 400 to 600 positive reports (4-7 weeks)
FLAT	• Highly sensitive and specific • Results available within 1 day	• Does not detect specimens due to high cost • False positivity may result due to contamination
Fluorescence with direct FLAT	• Useful in diagnosis of active pulmonary TB	



Other diagnostics

- Tuberculin skin test (TST) and Interferon gamma release assay (IGRA)

TST	IGRA
• High sensitivity and low specificity • False positivity can occur in BCG vaccinated individuals • Type IV cell-mediated hypersensitivity (CMI) • Cross-reacts with non-TB mycobacteria • Low cost • Not recommended for all age groups • Operator dependent • Cannot differentiate active and latent TB	• High sensitivity and high specificity • Unaffected by previous BCG vaccination • In vitro T-cell release of interferon gamma (IFN-γ) • Cross-reacts with non-TB mycobacteria is minimal • High cost • Recommended above the age of 2 years • Operator not dependent • Cannot differentiate active and latent TB

- Adenosine deaminase (ADA)
 - Useful supplementary test for diagnosis of TB especially extrapulmonary TB, such as tuberculous pleural effusion (e.g. Pleural fluid ADA) or tuberculous meningitis
 - Measures ADA enzyme activity: a marker of T-cell activation in response to TB
 - High sensitivity and specificity
 - Cannot differentiate active and latent TB
- Latex flow urine lipo arabinomannan assay (LFAM)
 - VIT specifically targets extrapulmonary TB

Nipah Virus

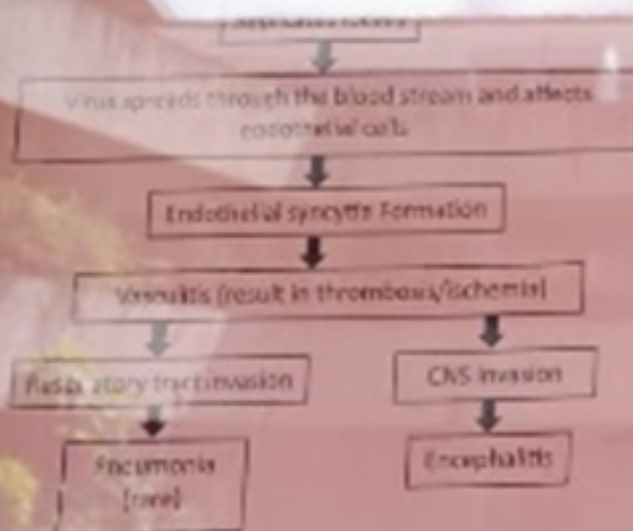
WHAT YOU NEED TO KNOW

Introduction

- Nipah virus (NV) is a zoonotic, emerging RNA virus that causes severe encephalitis and respiratory disease in humans.
- First identified in 1998-1999 during an outbreak in Malaysia and Singapore.
- Associated with high case fatality rates (40-75%) and potential for outbreaks.
- In 2026, an outbreak has been reported in India, with two laboratory-confirmed cases in West Bengal on the 26th of January 2026. (WHO)

Pathogenesis

Viral entry into the human host - via the respiratory tract, bite, gut, mucous membranes



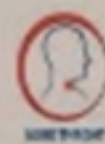
Clinical features

Early Symptoms

- Fever
- Headache
- Myalgia
- Sore throat
- Vomiting

Severe Disease

- Acute encephalitis
- Altered consciousness
- Seizures
- Coma
- Acute respiratory distress



Diagnosis:

- RT-PCR (blood, CSF, throat swab, urine) - Available at MRC First week
- EUSA (IgM, IgG antibodies)
- Neuroimaging: MRI may show diffuse brain involvement

Management

- No specific antiviral therapy proven
- Supportive care:
 - Airway and ventilation
 - Seizure control
 - Intensive care monitoring
- Ribavirin has been used experimentally

Precautions

- Avoid contact with sick pigs and bats
- Do not consume raw/half-eaten fruits
- Practice good hand hygiene
- Cook food thoroughly

Travel Plans

- Postpone non-essential travel to affect areas
- Avoid direct contact with sick people
- Follow updates from health authorities

Key takeaways:

- Nipah virus is a deadly zoonotic infection with high mortality
- There is no definitive treatment, and significant outbreak potential
- Early detection, prevention, and infection control is important
- WHO currently assess that the global risk of Nipah is low with no confirmed cases in Sri Lanka

Complications:

- Severe encephalopathy
- Relapse encephalitis (months-years later)
- High mortality
- Long-term neurological sequelae in survivors
- Pneumonia



Transmission

- Infectious period -> 4-14 day
- See -> Human
 - Consumption of contaminated raw date palm sap or fruits
 - Bats - natural reservoir of the virus
- Animal -> Human (via contaminated food/water)
 - Infected pigs (important in Malaysian outbreak)
- Human -> Human
 - Close contact with body fluids (notably in healthcare settings)
 - Respiratory route

EVERYTHING YOU NEED TO KNOW

ABOUT CHIKUNGUNYA

Self-regulatory actions

Term "Akangaga," refers to the "hard-press" pressure caused by the

...new, reported in the early
2000s, or a 40-year
return in 2006 and 2007,
...with a similar number

The district is a *Paragang*, one of the two parts of *Sinhala*, southern Sinhala and *Pukhira*, the *Paragang* of *Arak*, *Sinhala*, and *Indigenous*.

1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 26

...the transfer via

ethnic group.

samples

Symptoms



1999

- **Chlamydia** - a sexually transmitted infection (STI) that can cause serious complications if left untreated. It is the most common STI in the UK.
- **Gonorrhoea** - a sexually transmitted infection (STI) that can cause serious complications if left untreated. It is the second most common STI in the UK.
- **Trichomonas** - a sexually transmitted infection (STI) that can cause serious complications if left untreated. It is the third most common STI in the UK.
- **Herpes** - a sexually transmitted infection (STI) that can cause serious complications if left untreated. It is the fourth most common STI in the UK.
- **HPV** - a sexually transmitted infection (STI) that can cause serious complications if left untreated. It is the fifth most common STI in the UK.
- **Measles** - a viral infection that can cause serious complications if left untreated. It is a common childhood disease.
- **Scarlet fever** - a bacterial infection that can cause serious complications if left untreated. It is a common childhood disease.
- **Whooping cough** - a bacterial infection that can cause serious complications if left untreated. It is a common childhood disease.
- **Diphtheria** - a bacterial infection that can cause serious complications if left untreated. It is a rare but serious disease.
- **Tetanus** - a bacterial infection that can cause serious complications if left untreated. It is a rare but serious disease.
- **Polio** - a viral infection that can cause serious complications if left untreated. It is a rare but serious disease.
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Treatment	Number of patients	Number of patients with adverse effects	Number of patients with severe adverse effects
Control	100	10	2
Intervention	100	5	1

There is no specific antiviral treatment for chikungunya virus infections. Non-steroidal anti-inflammatory drugs (NSAIDs) and paracetamol can be used to relieve the pain.

Digital Media

- Still better than any other test system
- The Gold ESR test is between 20-32 min/ly
- Anticoagulant: Sodium Citrate
- Centrifuged at 1500g for 10 min
- ECG changes: normal, inverted

Specific Diagnostic Tests

- [illegible]

Keywords: *Self-esteem, self-esteem threat, self-esteem threat sensitivity, self-esteem threat sensitivity scale, self-esteem threat sensitivity scale-2*

- Vector Control: Source reduction, fogging, ULV spraying, larvicides, and larvivorous fish
- Promote sanitation and vector control
- Surveillance
- Communication: Use media to raise public awareness and provide accurate information
- Avoiding mosquito bites

Causative agents



Gram-negative
aerobic bacilli

Bacillus pseudomallei

Epidemiology

Endemic regions: Sri Lanka, Southeast Asia (Thailand, Malaysia, Singapore), South Asia, China.

- Seasonality: Common during rainy/wet seasons



Source of infection

Found in: Wet soil
Surface water



Melioidosis

Pathogenesis: *Bacillus pseudomallei*



Transmission

- Via:
 - Skin abrasions
 - Inhalation
 - Ingestion

High-risk groups:

- o Uncontrolled diabetes
- o Farmers and outdoor workers
- o Chronic kidney disease patients
- o Alcoholics

Clinical Features

Melioidosis is a great mimicker. - can mimic tuberculosis or pneumonia

- Fever: can present as a PUO
- Localized infection: Skin ulcers, abscesses (deep/superficial)
- Pulmonary infection: Cough, chest pain, pneumonia
- Disseminated infection: Abscesses in liver, spleen, prostate, or brain/spine

Laboratory Diagnosis

Specimens: Blood, sputum, pus, urine

Methods:

- Culture (gold standard)
 - o Grows on standard media
 - o Wrinkled colonies with earthy odor
- Gram stain:
 - o Gram-negative bacilli with bipolar staining ("safety pin" appearance)
- Melioidosis & PCR (available in FOM Colombo)

Treatment

- Long term antibiotic therapy

Prevention

- Personal Protection: Wear protective clothing and gloves when handling soil or muddy water. Cover open wounds, especially during the rainy season
- High-Risk Groups: Avoid outdoor exposure during heavy rain or flooding
- Laboratory Safety: Follow strict precautions due to risk of laboratory-acquired infection

Bacillus pseudomallei colonies on agar. The colonies are small, white, and wrinkled, with a characteristic earthy odor after 24 hours.

Miliary Tuberculosis

Introduction

- A form of disseminated tuberculosis caused by *Mycobacterium tuberculosis*.
- Results from hematogenous spread
- Characterized by numerous tiny (1-5mm) lesions resembling millet seeds

Epidemiology

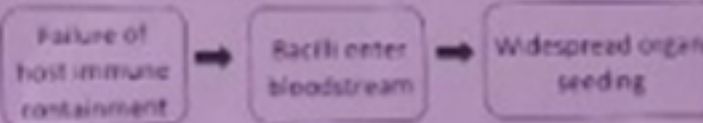
- Miliary TB: 1-2% of all cases of TB; up to 20% of extrapulmonary TB in immunocompetent individuals.
- Sri Lanka (2023): TB incidence 41.6/100,000, highest in the Western Province

Risk Factors

- Risk factors-
 - HIV infection
 - Immunosuppressive therapy
 - Cancer
 - Malnutrition
 - Diabetes mellitus
 - Chronic kidney disease
 - Old age

Pathogenesis

- Occur in primary infection



- Commonly affects:
 - Lungs
 - Liver
 - Spleen
 - Bone marrow
 - CNS (TB meningitis)
 - Kidneys



Diagnosis based on:

- Clinical suspicion
- Radiological findings
- Microbiological confirmation
- High index of suspicion required due to non-specific presentation

Investigation

Laboratory

- Anaemia
- Hyponatremia (SIADH)
- Elevated ESR/CRP



Imaging

- Chest x-ray: classic miliary mottling

Microbiology

- Sputum/BAL for AFB
- GeneXpert/NAAT
- Blood cultures (especially in HIV)

Other

- Bone marrow biopsy (high yield in disseminated TB)
- Lumbar puncture (if CNS involvement)

Clinical features

General symptoms:

- Prolonged fever
- Weight loss
- Night sweats
- Fatigue

System specific:

- Respiratory: cough, dyspnea (may be mild initially)
- CNS: headache, altered sensation
- Abdominal: Hepatosplenomegaly

Complications:

- ❖ Acute Respiratory Distress syndrome
- ❖ TB meningitis
- ❖ Multiorgan failure
- ❖ High mortality if untreated



Key takeaways

- ❖ Consider miliary TB in unexplained fever + systemic symptoms, chest x ray may become normal early
- ❖ Requires prompt ATT
- ❖ Commonly missed diagnosis → stay alert

Prognosis

Good with early diagnosis and treatment. Delayed treatment leads to increased mortality



Management

- Standard anti-tubercular therapy (ATT)

Isoniazid
Rifampicin
Pyrazinamide
Ethambutol } Initial 2 months

Isoniazid
Rifampicin } Remaining 4 months

- Longer duration if : CNS involvement, skeletal TB
- Adjunctive corticosteroids used in TB meningitis or severe respiratory involvement.