TICKS ARE THE VECTOR OF BACTERIA THAT CAUSES RELAPSING FEVER

MEDICAL ACADEMY NAMED AFTER S.I.GEORGIEVSKY OF VERNADSKY CFU

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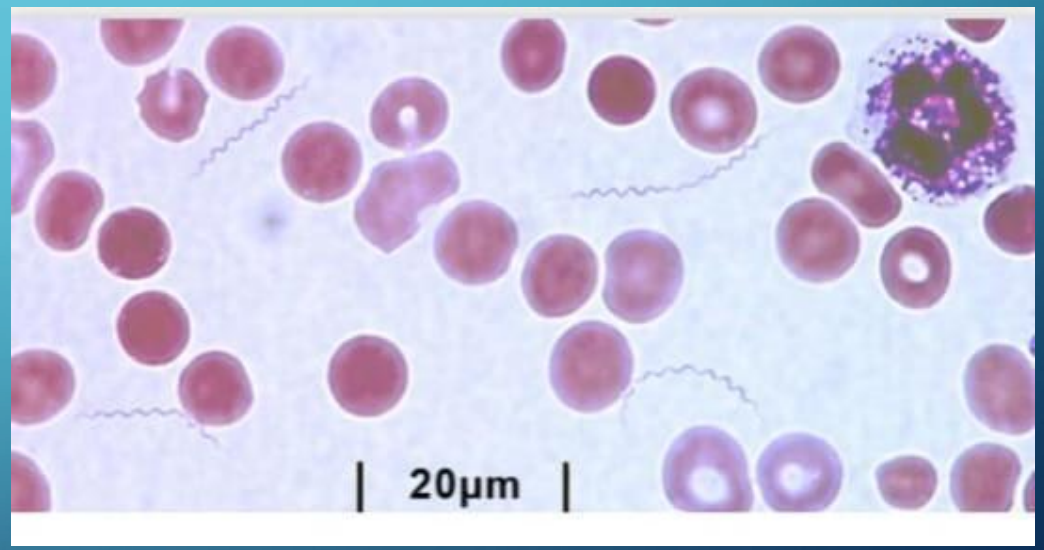
GENERAL CHARACTERISTICS OF *BORRELIA DUOTTONI, B. RECURRENTIS* :-

The tick's form consists of a capitulum (head) and a flattened, oval-shaped body called the idiosoma. Like spiders and other arachnids, adult ticks and nymphs have eight legs, though larvae emerge from the egg with only six. Hard ticks, like the ones found in Maine, have a hardened plate on the dorsal surface called a scutum. On females, this scutum takes up approximately 1/3 of the dorsal surface and can be useful in differentiating tick species.

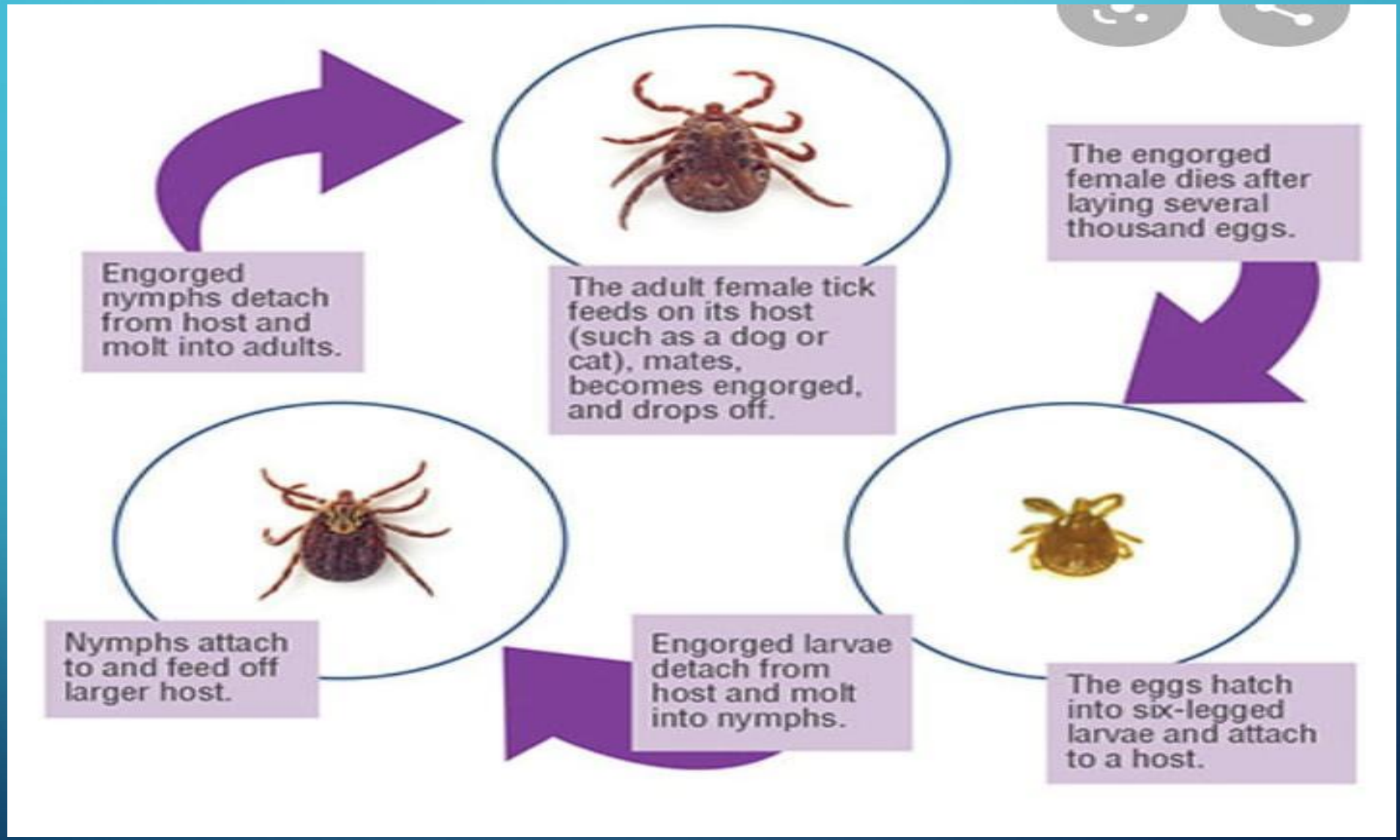
- On males, the scutum covers the entire dorsal surface and limits their feeding ability. The tick's mouthparts are located on the capitulum and are made up of the chelicerae and hypostome, which are used to penetrate and secure the tick to its host. During feeding, ticks secrete substances that help anchor it to the host, act as an anesthetic to mask the pain from the bite, and prevent blood from coagulating. Since ticks are efficient feeders and tenacious once attached, there is potential for transmitting disease. Mainers should be in the habit of performing tick checks after frequenting tick habitat.

BORRELIA DUOTTONI



LIFE CYCLE :-

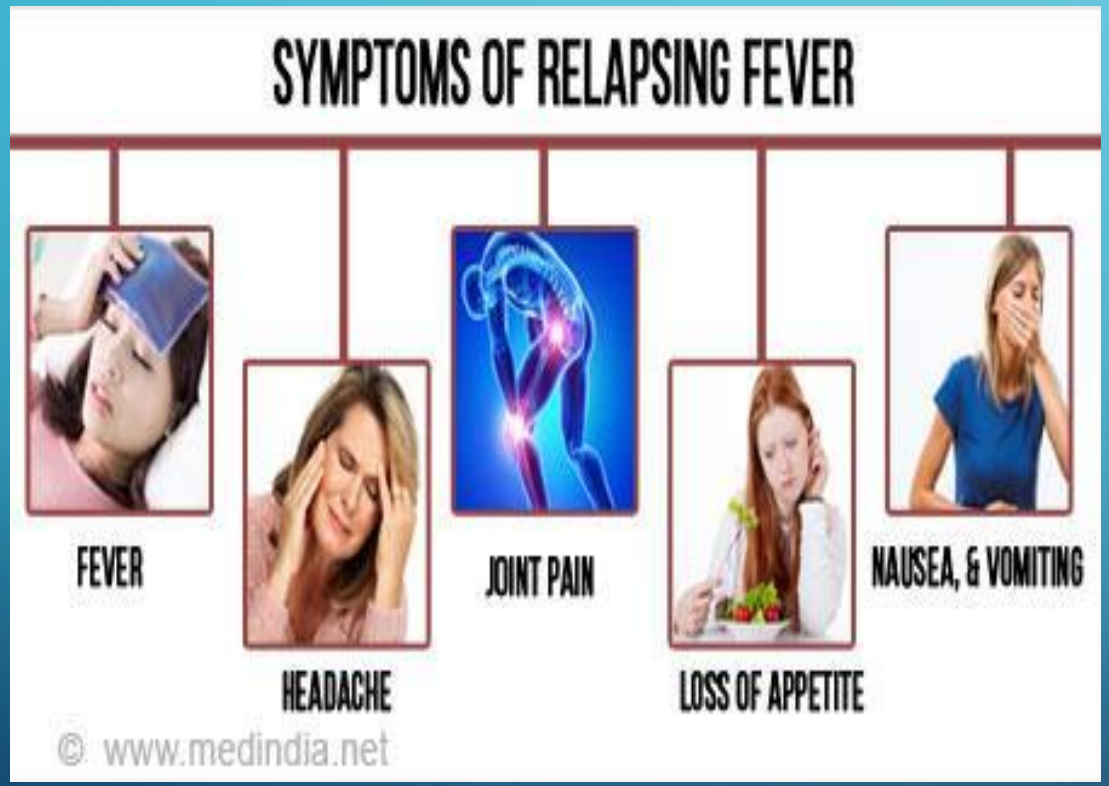
- Ticks go through four life stages:Egg; six-legged larva; eight-legged nymph; and adult. After hatching from the eggs, ticks must eat blood at each stage in order to move on to the next one. It can take up to 3 years to complete a full lifecycle, and most will die because they can't find a host for their next feeding.

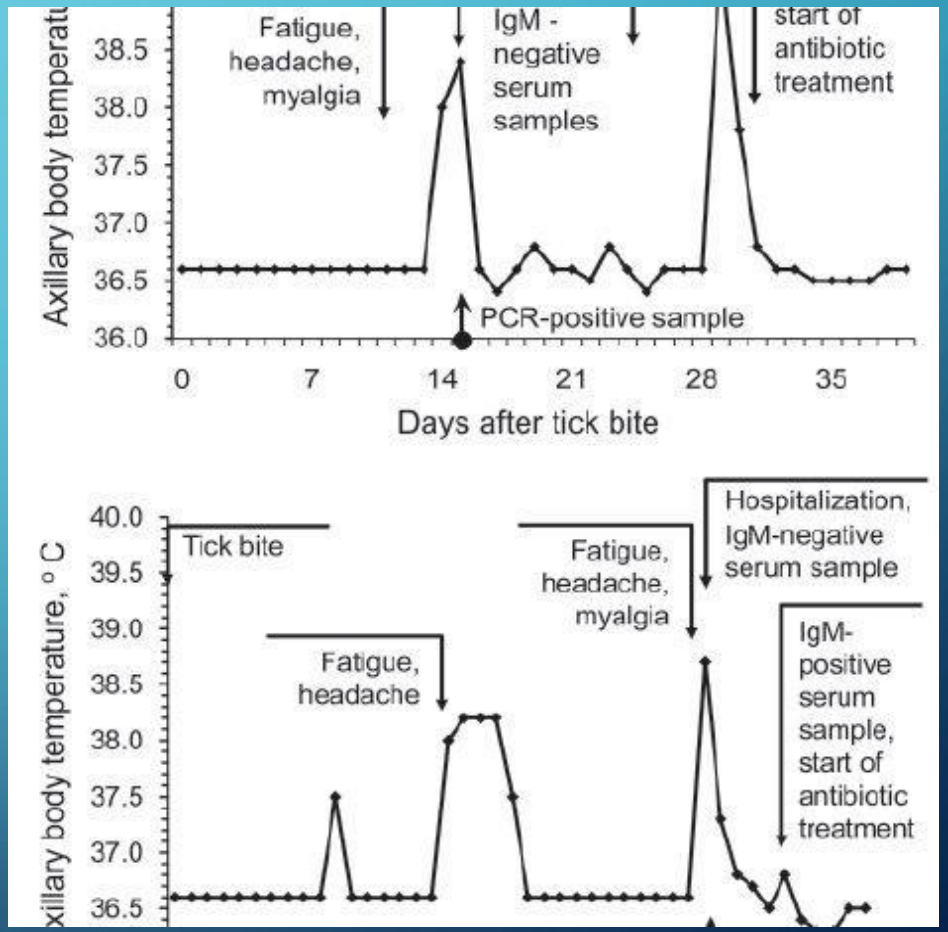

Engorged nymphs detach from host and molt into adults.
The adult female tick feeds on its host (such as a dog or cat), mates, becomes engorged, and drops off.
The engorged female dies after laying several thousand eggs.
Nymphs attach to and feed off larger host.
Engorged larvae detach from host and molt into nymphs.
The eggs hatch into six-legged larvae and attach to a host.

DISEASE ETIOLOGY :-

- The reservoir:
  - for agents of tick-born relapsing fever are wild rodents, and the human is an accidental host
  - for agent of louse-born relapsing fever is human
- Vectors:
  - for agents of tick-born relapsing fever are ticks
  - for agent of louse-born relapsing fever are lice
- The spirochetes mature and persist in the salivary gland and intestines of the arthropods and are transmitted to human by its byte
- The species of Borrelia are passed transovarially in the ticks
- The pathologic manifestation are similar in tick-born and louse-born relapsing fever

SYMPTOMS:-


SYMPTOMS OF RELAPSING FEVER
FEVER
HEADACHE
JOINT PAIN
LOSS OF APPETITE
NAUSEA, & VOMITING
© www.medindia.net


Axillary body temperature
38.5
38.0
37.5
37.0
36.5
36.0
Fatigue, headache, myalgia
IgM - negative serum samples
start of antibiotic treatment
PCR-positive sample
0
7
14
21
28
35
Days after tick bite
Axillary body temperature, °C
40.0
39.5
39.0
38.5
38.0
37.5
37.0
36.5
Tick bite
Fatigue, headache
Fatigue, headache, myalgia
Hospitalization, IgM-negative serum sample
IgM-positive serum sample, start of antibiotic treatment

LABORATORY DIAGNOSIS :-

1.Spirectomia:-

Laboratory TestingSpirochetemia (spirochetes in blood) in TBRF patients often reaches high concentrations (>106 spirochetes/ml). Thus, microscopy is a useful diagnostic tool for TBRF. The diagnosis of TBRF may be based on direct microscopic observation of relapsing fever spirochetes using dark field microscopy or stained peripheral blood smears. Spirochetes are more readily detected by microscopy in symptomatic, untreated patients early in the course of infection. Other bacteria, such as Helicobacter, may appear morphologically similar, so it is important to consider clinical and geographical characteristics of the case when making a diagnosis of TBRF based on microscopy. Additional testing, such as serology or culture, is recommended

2. Xenodiagnosis

Because relapsing fever borreliae are vector-borne pathogens, it is possible to use xenodiagnosis to detect the causative Borrelia in the vector. We recently developed a protocol for the rapid detection of B. crocidurae in Ornithodoros soft ticks using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF-MS) (43). MALDI-TOF-MS is, thus, emerging as a potential tool for the rapid identification of vectors (44) and spirochaeta such as Leptospira (45) and Borrelia (46). We first extended it to the dual identification of vectors and vectorized relapsing fever borreliae directly in ticks (43). For each Borrelia species, a consensus pattern referred to as the mean spectrum projection (MSP) was obtained using the Biotyper MSP Creation Standard Method (Bruker Daltonics).

- A Borrelia MALDI-TOF-MS database was created for relapsing fever borreliae and yielded a unique protein profile for each species.After the database had been developed, MALDI-TOF-MS was able to be used to identify tick species and the presence of relapsing fever borreliae in a single assay. The Borreliae database, along with a custom software program that subtracts the uninfected Ornithodoros sonrai profile, was used to detect B. crocidurae. The legs were homogenized and the supernatant was spotted onto a steel target plate in quadruplicate. Using in-house subtraction software, the MSP pattern of non-infected O. sonrai was removed from the pattern of infected ticks. This software normalizes the spectra and compares common peaks in infected and uninfected ticks, subsequently generating the MSP spectra before performing the subtraction. After subtraction, the list of remaining differential masses (m/z) was compared with the B. crocidurae MSP.

3. Personal hygiene:-

Isolation and CultureScreening tests currently consist of microscopic examination and culture of midgut tissues dissected from live vectors of relapsing fever borreliae (18). Although somewhat difficult and time-consuming, this culture is definitive for the diagnosis of spirochaetal infections in ticks. It also provides a source of new Borrelia strains (47). Borreliae grow at 32°C in Barbour-Stoenner-Kelly-H (BSK-H) medium supplemented with 10% heat-inactivated rabbit serum. Dark-field microscopic observation ensures the absence of any contaminant organisms and gages the growth of the borreliae. Fresh blood samples from infected patients can be cultured using BSK-H medium or by intraperitoneal inoculation of 6- to 8-week-old female laboratory BALB/c mice. Borreliae in mice are detected after 5–6 days by microscopic examination of Giemsa-stained peripheral blood smears, followed by qPCR of blood samples. Outside of Africa, it has been demonstrated that Borrelia hermsii (new world relapsing fever borreliae) infection in mice can be quantified by qPCR

- Outside of Africa, it has been demonstrated that Borrelia hermsii (new world relapsing fever borreliae) infection in mice can be quantified by qPCR and that this technique matched the results obtained by microscopic examination of blood smears (48). In a study based on 100 field-collected Ixodes ricinus ticks, dark-field microscopy, culture, and PCR were shown to be comparable as procedures for detecting Lyme borreliosis spirochaeta in ticks. Thirteen ticks were found to be positive through culture in BSK-H medium, 16 ticks were found to be infected with spirochetes by dark-field microscopy, and 22 ticks were found to contain Borrelia burgdorferi-specific DNA by PCR using a primer set based on sequences of the flagellin gene of B. burgdorferi (20). This study showed the inability of culture to detect spirochaeta compared to dark-field microscopic analysis and PCR. For the culture of tick-borne relapsing fever borreliae in Africa, B. hispanica remained uncultured in axenic medium until 1976 (49) and B. duttonii until 1999 (50). B. crocidurae, first described in musk shrew blood in Senegal in 1917 (51), was only cultured in axenic medium in 1999 (52).

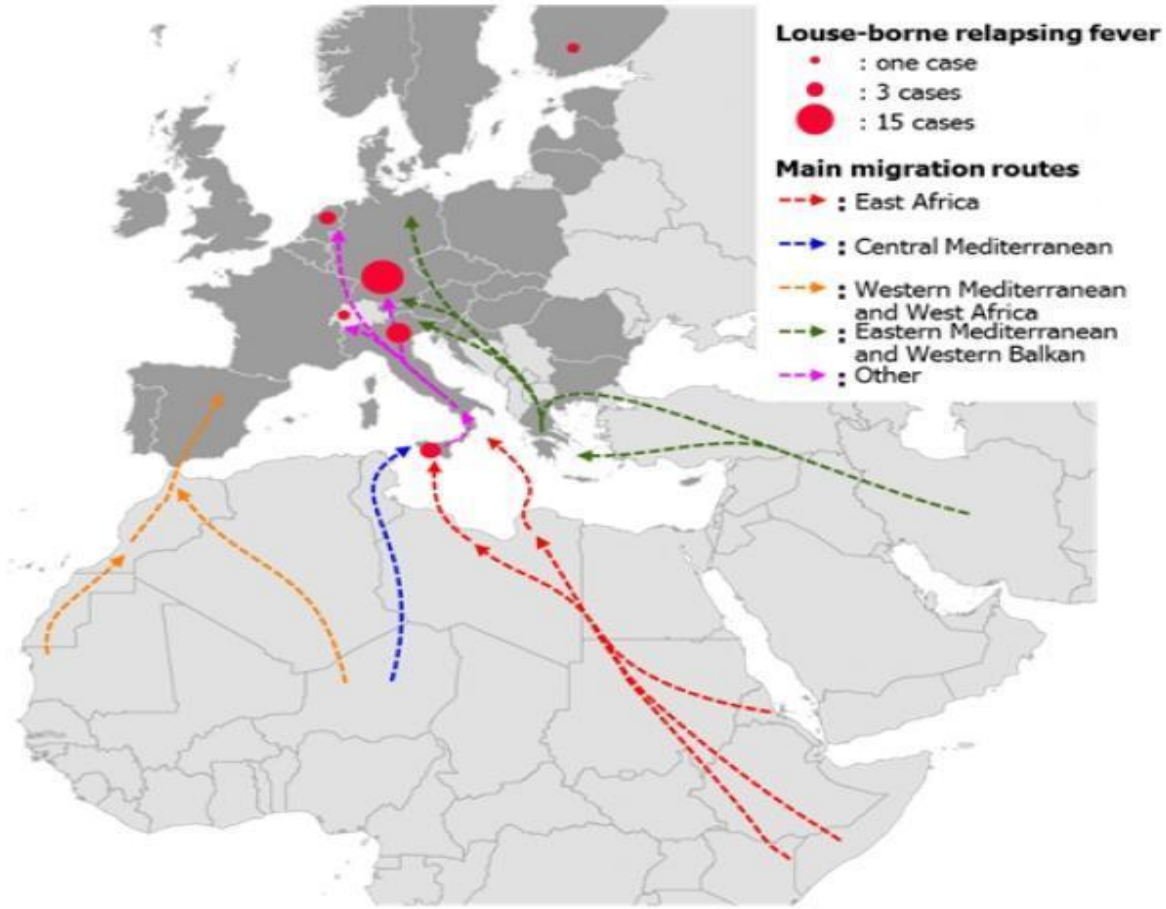
PREVENTION:-

- Deterrence/PreventionLouse-borne relapsing fever (LBRF) can be prevented by eliminating circumstances that promote louse infection (eg, crowding, homelessness) and good personal hygiene (eg, changing clothes at frequent intervals, bathing, boiling and washing clothes and bedding).Delousing with 1% lindane, DDT powder, or Lysol is useful in shelters and in patients and household contacts.Avoiding rodents can prevent tickborne relapsing fever (TBRF). This includes use of appropriate clothing and tick repellents when entering tick-infested areas.

EPIDEMIC:

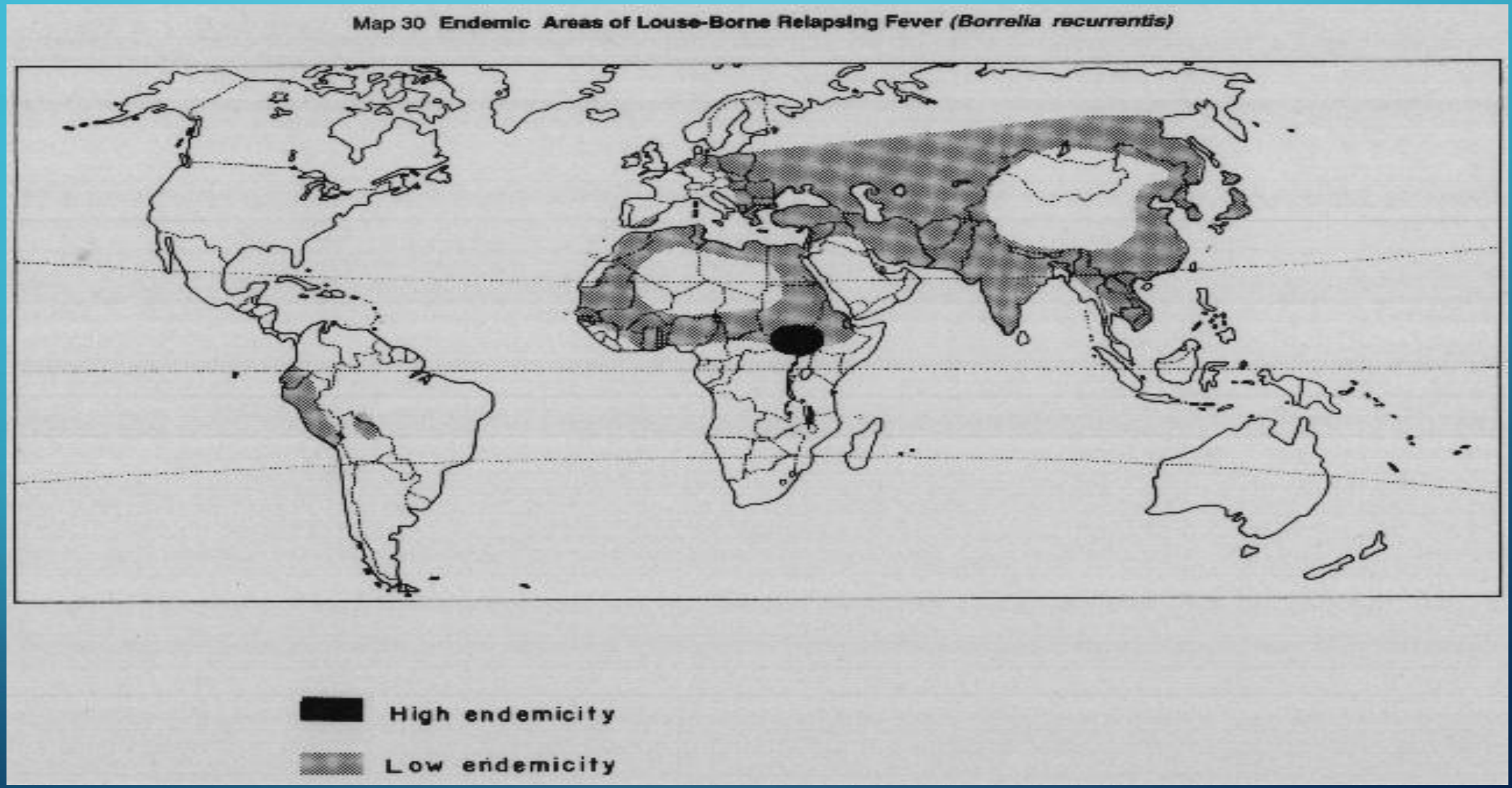
- 1. Louse-borne relapsing fever is rare in the US; it is endemic only in northeast Africa (Ethiopia, Sudan, Eritrea, Somalia) and was recently diagnosed in Europe in refugees from these African . Louse-borne relapsing fever tends to occur in epidemics, particularly in regions affected by war, and in refugee camps. The is infected by feeding on a febrile patient; humans are the only reservoir. If the louse is crushed on a new host, Borrelia recurrentis is released and can enter abraded skin or bites. B. recurrentis also is able to penetrate intact mucosa and skin. Intact lice do not transmit disease.

Figure 7. Distribution of the 27 cases of louse-borne relapsing fever in Europe 2015, reporting country and main migration routes



2. Tick-borne relapsing fever is endemic in the Americas, Africa, Asia, and Europe. In the US, the disease is generally confined to the western states, where occurrence is highest between May and September. Ticks acquire the spirochetes from rodent reservoirs. Humans are infected when spirochetes in the tick's saliva or excreta enter the skin rapidly as the tick bites. Infection is more likely to be acquired by people sleeping in rodent-infested cabins in the mountains and has also been associated with spelunking.Congenital infection with Borrelia has also been reported. Borrelia has also been rarely transmitted by blood transfusion.

Map 30 **Endemic Areas of Louse-Borne Relapsing Fever** ***(Borrelia recurrentis)***



EFFECT IN INDIA:-

1. A case report of relapsing feverAtul R Aher, Harshada Shah, Vichal Rastogi, Prabhu K Tukaram, Reshmi Chanda ChoudhuryDepartment of Microbiology, People's College of Medical Science and Research Centre, Bhopal, India.
2. Relapsing fever is an acute febrile illness caused by spirochetes of the genus Borrelia. The high fevers of presenting patients spontaneously abate and then recur. Here we report a 50-year-old woman having relapsing fever associated with thrombocytopenia. Giemsa staining of peripheral blood smear revealed spiral organisms morphologically resembling Borrelia. A rare case of relapsing fever which was successfully treated with doxycycline

VIDEO LINK:-

1. https://youtu.be/xPLMnTU9Hs8
2. https://youtu.be/6B7h4jIAsMQ
3. https://youtu.be/VRUexGLd7EQ

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Thank
you