RICKETTSIAL DISEASES

MEDICAL ACADAMY NAMED BY S.I.GEORGIEVSKY "CFU NAMED BY V.I.VERNADSKY

DEPARTMENT OF MEDICAL BIOLOGY

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INTRODUCTION ABOUT TICKS

Domain:	Bacteria
Phylum:	Proteobacteria
Class:	Alphaproteobacteria
Order:	Rickettsiales
Family:	Rickettsiaceae
Genus:	*Rickettsia*
Species group:	Spotted fever group
Species:	***R. conorii***
Binomial name	
Rickettsia conorii	

Scientific classification	
Kingdom:	Bacteria
Phylum:	Proteobacteria
Class:	Gammaproteobacteria
Order:	Legionellales
Family:	Coxiellaceae
Genus:	*Coxiella*
Species:	***C. burnetii***
Binomial name	
Coxiella burnetii	

GENERAL CHARACTERISTICS

Structurally simiar to gram (-) bacili

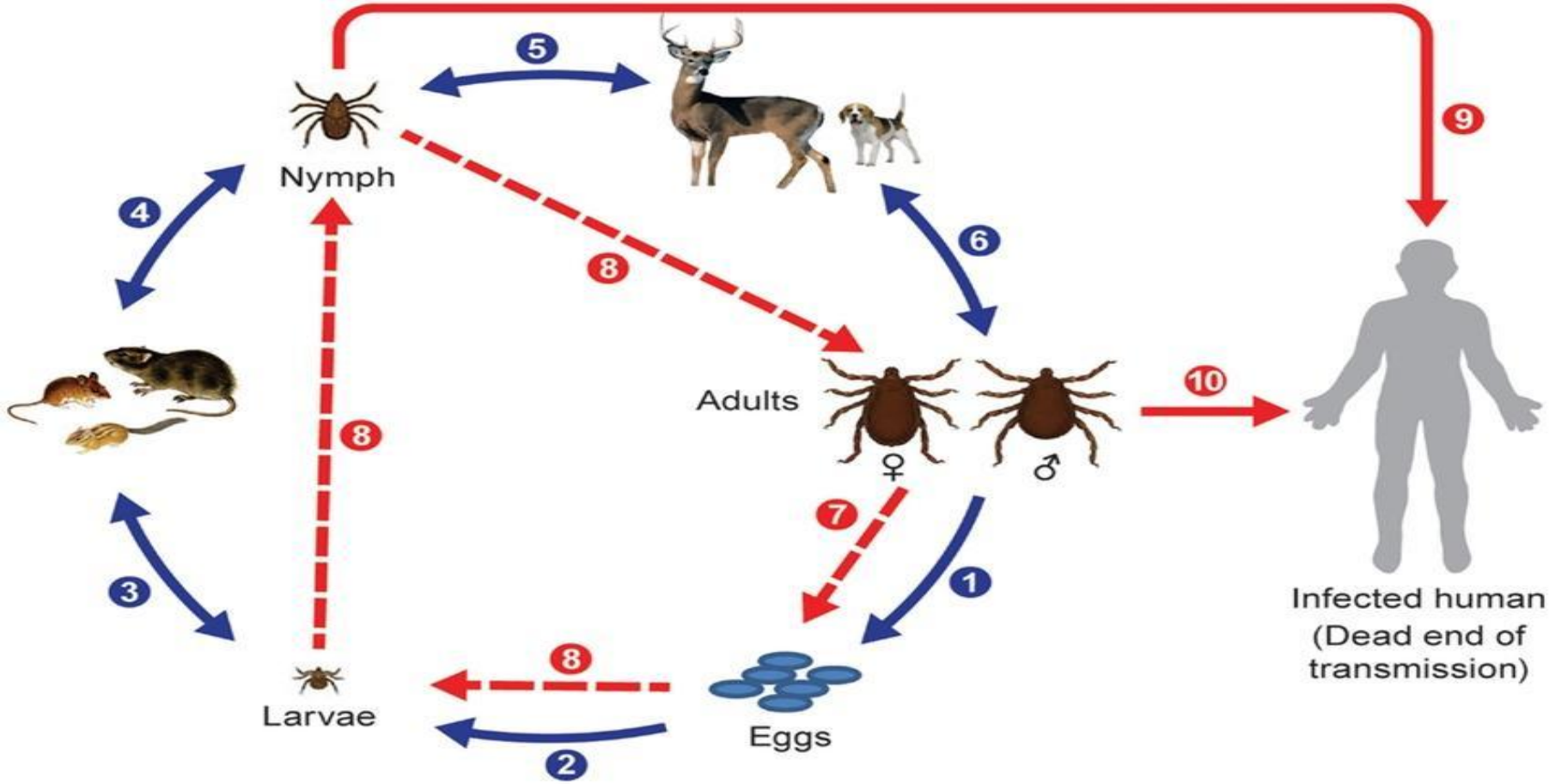
DNA S RNA Erzymes tor Kreti's cyde Rbosomes for protein syrthesis #Intibited by anibiotics → Tetracycline & Chloramphenicol

Originally thought to be viruses Small size Stain pooriy with gram stain #Grows only in cytoplasm of Eukaryotic cells Obligate intracelular parasites

#EXCEPT Coxiella Rickettsia survival depends on entry, grawth, and replication within the tytoplasm of eukaryotic host celis.

#That's why. they cannot ive in artficial nutrient environmenns and is grown either in issue or embryo cultures. Reservoirs animals & arthropods

LIFE CYCLE


Nymph
Adults
♀
♂
Larvae
Eggs
Infected human
(Dead end of
transmission)
1
2
3
4
5
6
7
8
8
8
9
10

Life cycle

The most common hosts are ticks.

Ticks that carry rickettsia fall into the family of Ixodidae ticks also known as “hard bodied” ticks.

Ticks are vectors, reservoirs and amplifiers of this disease.

There are currently three known tick specifics that commonly carry rickettsiia

American dog tick (Dermacentor variabilis)

Rocky Mountain Wood Tick (Dermacentor andersoni

Brown dog tick (Rhipicephalus sanguine. Ticks can contract rickettsii by many means. First,

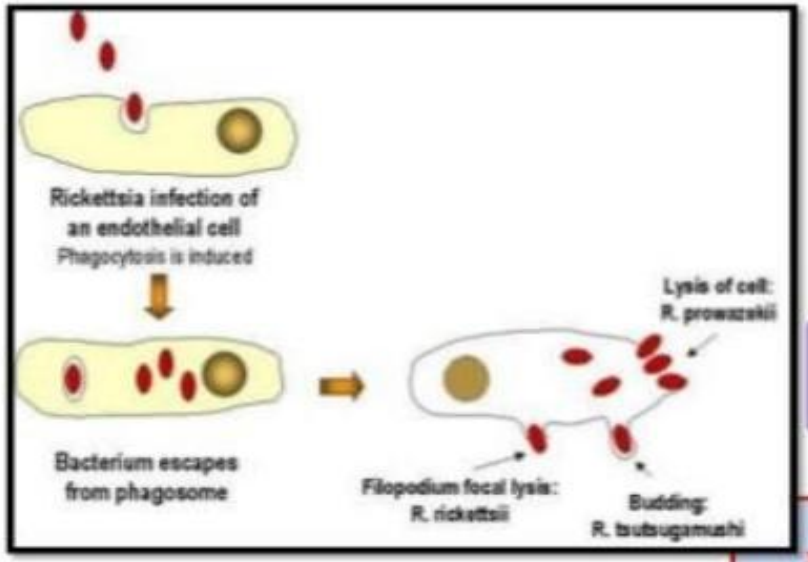
an uninfected tick can become infected when feeding on the blood of an infected vertebrate host; such as a rabbit, during the larval or nymph stages, this mode of transmission called transstadial transmission.

Once a tick becomes infected with this pathogen, they are infected for life.Both the American dog tick and the Rocky Mountain wood tick serve as long-term reservoirs for Rickettsia rickettsii, in which the organism resides in the tick posterior diverticulae of the midgut, the small intestine and the ovaries. citation needed In addition, an infected

Etiology

- Treatment Without waiting for laboratory confirmation antibiotic therapy should be instituted when rickettsial disease is suspected.
- Doxycycline is the drug of choice Doxycycline (100 mg bid orally for 7-15 days),or azithromycin (500 mg orally for 3 days) children aged < 8 years and pregnant females-
- azithromyčiniclarithromycin Oral treatment is used unless patient is vomiting or complicated Additional benetits of azithromycin
- long tissue halft life and the long lasting post-antibiotic effect causes no relapse despite the use of a single dose 2. Sate in child and pregnancy

Pathogenesis:



Obligate I/C organisms

↓

Dermal target cells (fibroblasts, macrophages, dermal dendritic cells, and lymphatic endothelium)

↓

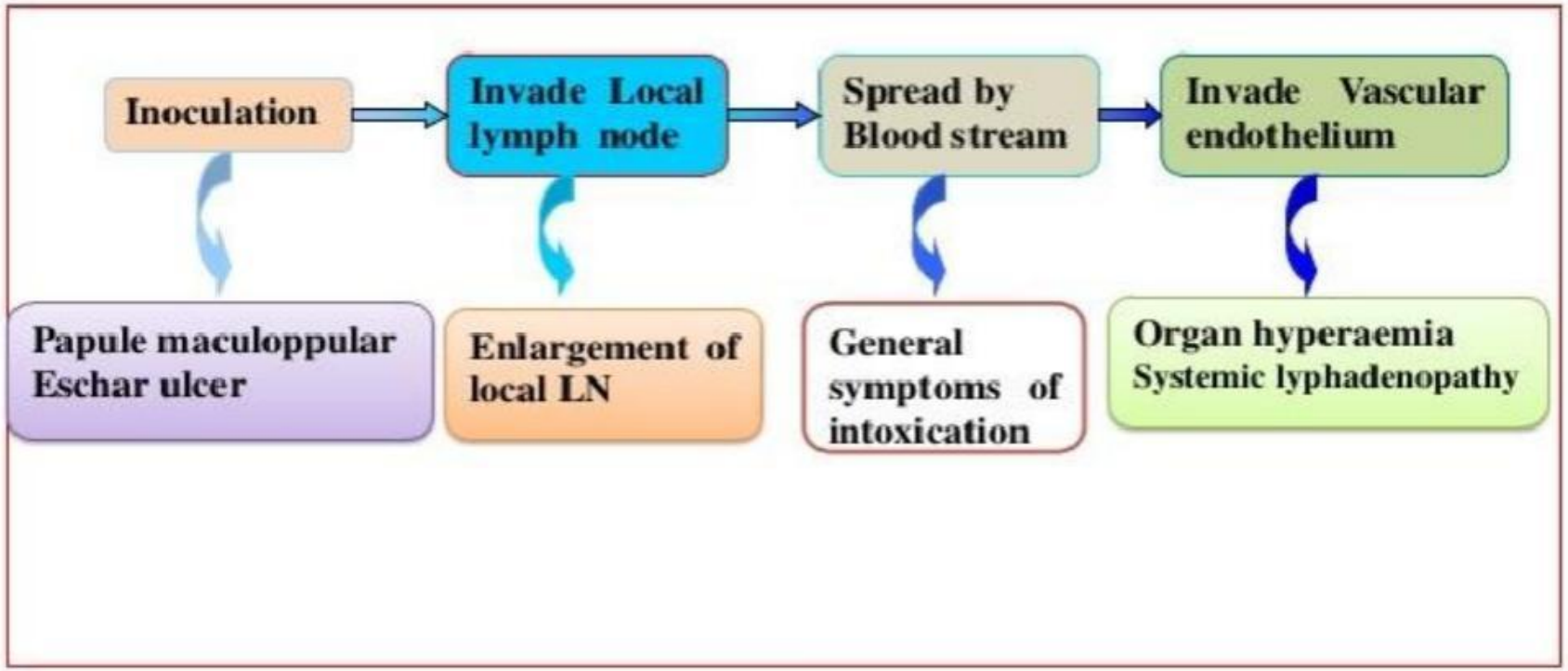
Engulfed by mononuclear phagocytes in the blood stream

↓

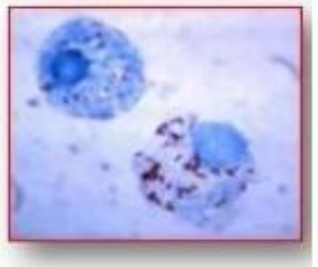
Lungs and brain - lethality of rickettsioses

Rickettsia rickettsii is the only organism in the genus that invades beyond the blood vessel lining endothelium; they invade adjacent vascular smooth muscle cells, particularly in arterioles

Pathogenesis



Diagnosis:

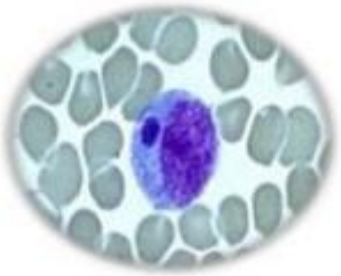


Staining:

➢Not stained by the Gram's method

➢Retain basic fuschin when stained with Gimenez method- Bright red

- **Initial diagnosis**
  - History, clinical signs
  - Hematologic abnormalities
  - Serum chemistry



- **Definitive diagnosis**
  - IFA
  - ELISA
  - PCR
  - Culture

Clinical Signs | **Blood Smears** | **Serological Tests** | **Biopsy** | **Gene Diagnosis**

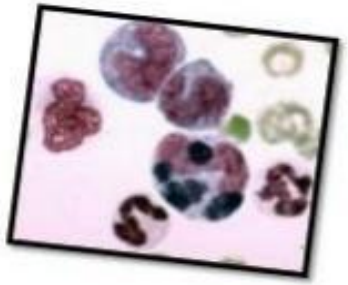
Diagnosis

- A dog with fever, enlarged lymph nodes, bleeding, or arthritis in multiple joints.
- Low platelet numbers, high globulin levels, and mild anemia on blood testing

Canine thrombocytopaenia

POSTMORTEM LEISONS

Pancytopenia



Ehrlichia canis **seen in a membrane-bound inclusions (morulae) within the cytoplasm of a monocyte (buffy coat smear, Wright stain)**

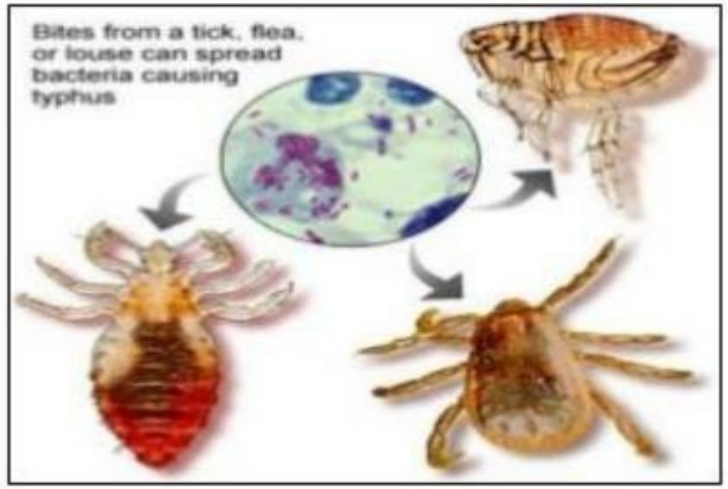
RICKETTSIAL INFECTIONS

Classified into groups:

1 **Typhus Group**

2 **Spotted Fever Group**

3 **Scrub typhus**

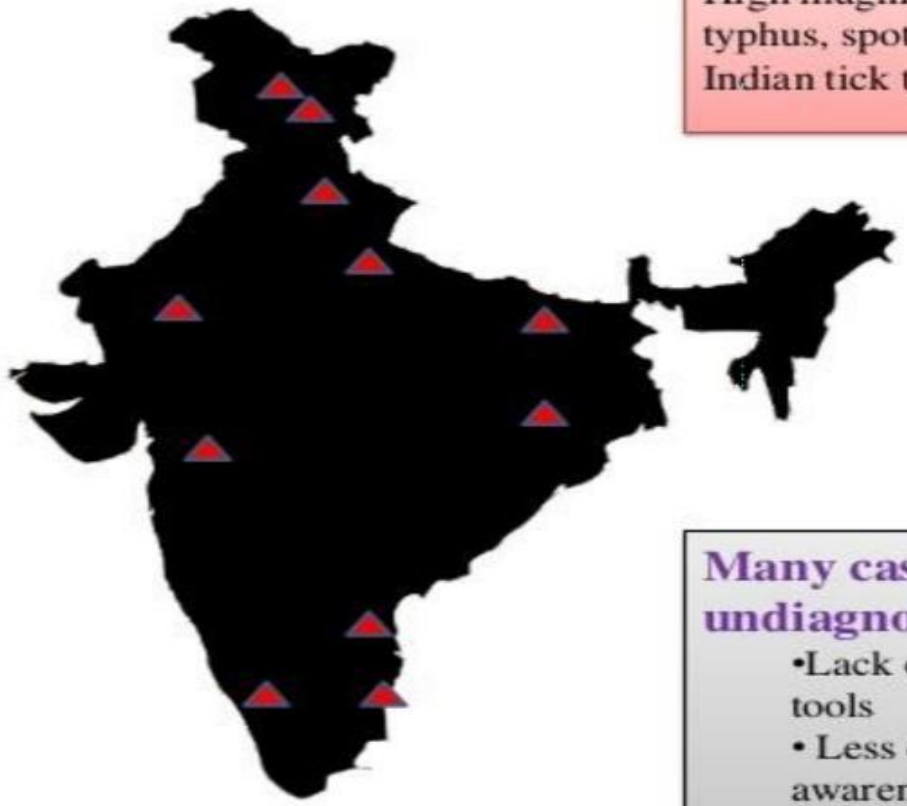


INDIAN SCENERIO: A GLIMPSE

Has been reported from 11 states in India:

- Jammu and Kashmir
- Himachal Pradesh
- Uttaranchal
- Rajasthan
- Assam
- West Bengal
- Maharashtra
- Pondichery
- Kerala
- Tamilnadu

(Mahajan S. K, 2012)



Re-emerging

High magnitude of scrub typhus, spotted fever and Indian tick typhus

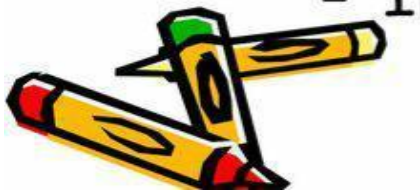
(Batra HV, 2007)

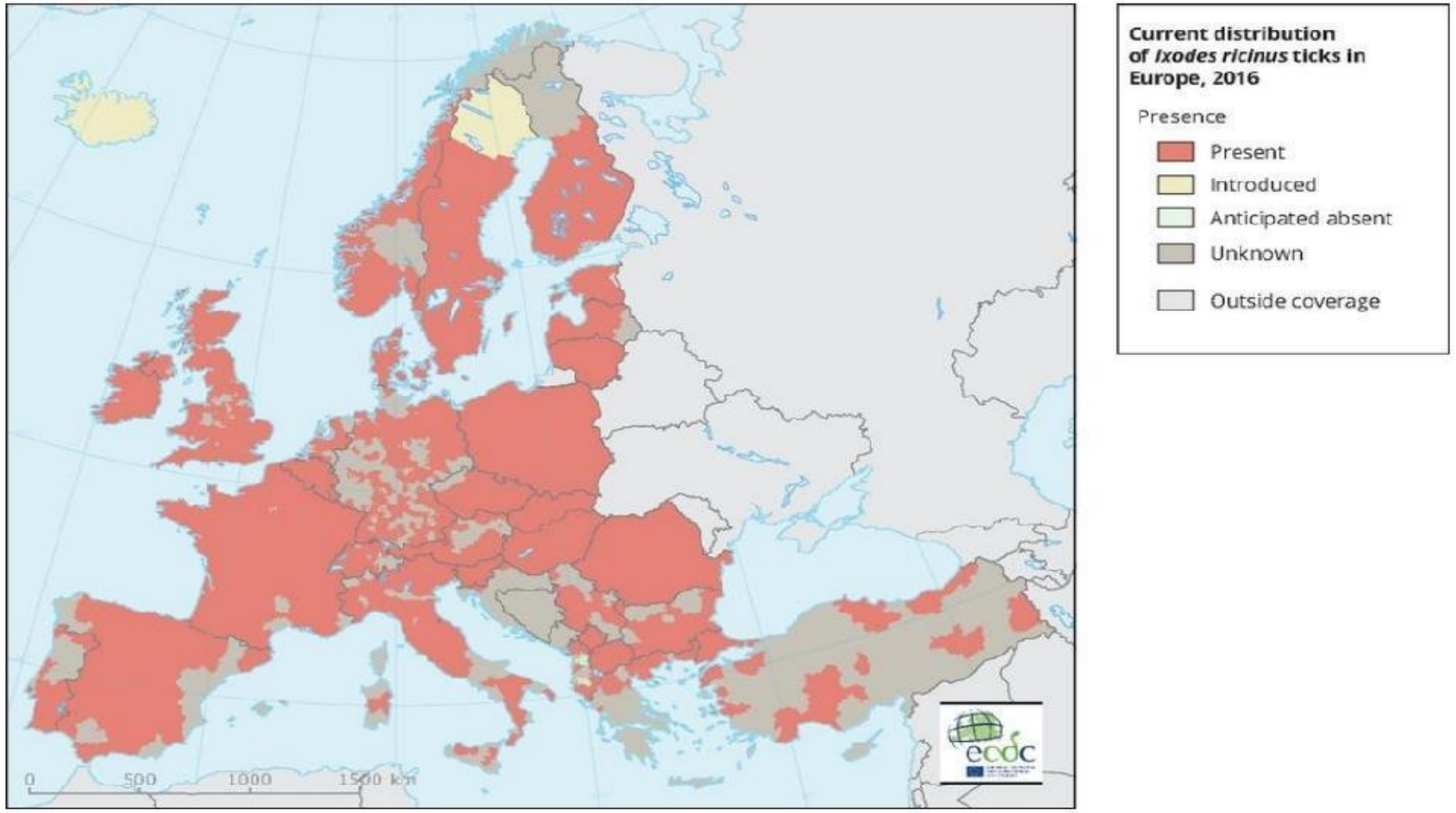
Many cases go undiagnosed ???

- Lack of diagnostic tools
- Less clinical awareness
- Lower index of suspicion

Rickettsia: Treatment and Prevention

- RMSF
  - Doxycycline drug of choice
  - Avoid ticks, wear protective clothing, use insect repellents, insecticides
  - In infested areas, check and remove ticks immediately
- Typhus Fever
  - Doxycycline effective
  - Improve personal hygiene and living conditions, reduce lice by insecticides, control rodent population
  - Inactivated vaccine for epidemic typhus




Current distribution of *Ixodes ricinus* ticks in Europe, 2016
Presence
Present
Introduced
Anticipated absent
Unknown
Outside coverage
0
500
1000
1500 km
ecdc

Features	Scrub typhus	Murine typhus	Indian tick typhus	Epidemic typhus	Rickettsial-pox	Rocky mountain fever	Q fever
Agent	*Rickettsia tsutsugamushi*	***R. moser***	*R. conorii*	*R. Prowazekii*	*R. akari*	*R. rickettsii*	***Coxiella burnetii***
Reservoir	Mite	Commensally rats	Ticks	Man	Domestic rodents	Wild rodents	Cattle
Insect vector	Mite	Flea	Tick	Louse	Mite	Tick	-
IP	10–12 days	1–2 weeks	3–7 days	1–2 weeks	7–9 days	5–7 days	2–3 weeks
Eschar	Present	Absent	Present	Absent	Present	Present	Absent
Rash	Centrifugal	Centrifugal	All over body	Centrifugal	All over body	Centripetal	No rash
Treatment	Tetracycline	Tetracycline	**Doxy**	**Tetra**	Doxy	Doxy	Doxy
Remark	Most common rickettsial infection	Also known as endemic typhus	Atypical measles	-	Atypical chickenpox	-	Transmitted by aerosol

RICKETTSIA IN CRIMEA

- territory the Crimean peninsula is endemic in a number of transmissible natural focal infections, including the Mediterranean spotted fever (Marseilles fever)
- the causative agent of which is Rickettsia conorii.

In Crimea, a disease similar to the Mediterranean spotted fever was first described in 1938

At preSentation, there is a tendency to the more severe clinical presentation of the Mediterranean spotted fever in the territory of Crimea, which is evident from the pre- dominance ones, the intensification of intoxication syndrome

as well as the appearance of various atypical forms of the disease caused by this pathogen . The first lethal case caused by this infection was registered in Crimea in 1996.

The true incidence of the Mediterranean spotted fever in Crimea is probably much higher than of moderately severe forms over the light that officially recorded, since the planned examina- tion of the blood serum of 350 healthy donor individ- uals revealed antibodies to R. sibirica antigen in donors onIn 2014

. 14 cases of the Mediterranean spotted fever were recorded 7 of which were laboratory-confirmed by one of the variants of the PCR method. All identified cases of the disease had a clinical form of moderate severity. In in Crimea, the territory of depending on the etiological agent, as well as the phys- 2015, 16 patients with this infection were registered; one patient had a severe form of the disease


UKRAINE
Black Sea
CRIMEA
RUSSIA
Simferopol
Sevastopol
Yalta
Black Sea

Species	Disease	Tick species associated (literature data)	Tick species associated (present study)	Fever, %	Diffuse rash, %	Eschar, %	Lymphadenopathy	Lymphangitis	Reported mortality rates,%
R. conorii conorii	Mediterranean spotted fever	*Rh. sanguineus, Rh. simus* (?)	*Rh. e. evertsi*	100	97	72	Rare	No	1–5
R. africae	African tick-bite fever	*A. variegatum, A. hebraeum, Rh. (B.) microplus, Rh. (B.) decoloratus*	*Rh. e. evertsi, Rh. (B.) annulatus*	92	43	98%, often multiple	Yes	No	Very low
R. sibirica mongolitimonae	Lymphangitis-associated rickettsiosis	*H.truncatum, H. asiaticum, H. anatolicum excavatum, Rh. pusillus*	*H.truncatum*	100	78	89%	55%	Yes, up to 44%	0
R. aeschlimannii	Unnamed	*H. m. marginatum, H. m. rufipes, H. aegyptium, Haemaphysalis inermis*	*H.truncatum,H. m. rufipes, Rh. e. evertsi*	Yes	Yes	Yes	?	?	0
R. massiliae	Unnamed (one case)	*Rh. sanguineus, Rh. turanicus, Rh. muhsamae, Rh. lunulatus, Rh. sulcatus*	*Rh. guilhoni*	Yes	Yes	Yes	?	?	0

doi:10.1371/journal.pntd.0000821.t004

Conclusion

- Scrub typhus is a significant public health threat in India, yet it is under-recognised and grossly under-diagnosed
- Doxyxcycline is the drug of choice
- Azithromycin is a good alternative
- Unavailability of IV doxycycline to treat severe infection necessitates urgent advocacy
- Information and advocacy are needed for investing in surveillance, prevention and detection, as well as appropriate management strategies

Varghese et al. CMC Vellore. Scrub typhus in India

Video link references

https://youtu.be/B8D0JeonHiU

https://youtu.be/tcg-iShuQt4

https://youtu.be/XaLBynjL000

- STAY HOME

STAY SAFE

STAY HAPPY