

The bacterium *Borrelia burgdorferi* s.l. and the clinical symptoms of Lyme Borreliosis

Lecture

held

in Chengdu, Sichuan

12. November 2015



What is Lyme Disease or Lyme Borreliosis

- Lyme disease (LD) is a multisystemic disease **caused by *Borrelia burgdorferi* s.l.**, a spirochete. It is called after the Swiss entomologist Dr. Burgdorfer, who detected it **1981** in the midgut of the tick *Ixodes scapularis*. To date, at least 19 species of *Borr.burgd.s.l.* have been described, 3 of them have been found so far in China: *B. garinii*, *B.afzelii* and *B. valaisiana*

Qin Hao et al.:Distribution of *Borr.burgd.s.l.* in China in: J Clin Microbiol 2011 Feb;49(2) 647-50

Does Lyme Disease or Lyme Borreliosis exist in China?

- The first case of Lyme disease (LD) was reported in Hailin county, Heilongjiang province in **1987**.
- Thereafter, LD has been documented in more than 20 provinces and autonomous regions.
- Genotyping studies for *Borr.burgdorferi* s.l. have been conducted.
- Serological studies for Immunoglobulin G (IgG) antibodies against *Borr.burgd.* have been done f.e. in Zhejiang province.

Tick-borne diseases (TBD) are on the rise!

- In 30,000 randomly sampled people from 20 different P/A/M of China the serological positivity of LD was 1,06-**12,8%**. The mean positivity rate was overall 5,06 % and 5.33 % in the forest areas.
- The mean morbidity was 2,84 % in the forests of Northeastern China.
- In recent years, an increasing incidence of LD has been reported, which causes significant harm to livestock and human health and lives

Xian-Bo Wu et al:Distribution of tick-borne diseases in China, Parasites & Vectors, 2013,6:119

Where have Borr.burgd.s.l. been found in China?

- Human cases of Lyme Borreliosis have been confirmed in 29 provinces/municipalities (P/M). Natural foci are present in at least 19 P/M in China.
- In Heilongjiang, Liaoning, Inner Mongolia over 3 million people suffer tick bites annually, of those, ca. 30, 000 become infected. Ca.10 % of the new cases may **turn into chronic infections** over 2-17 yrs without treatment

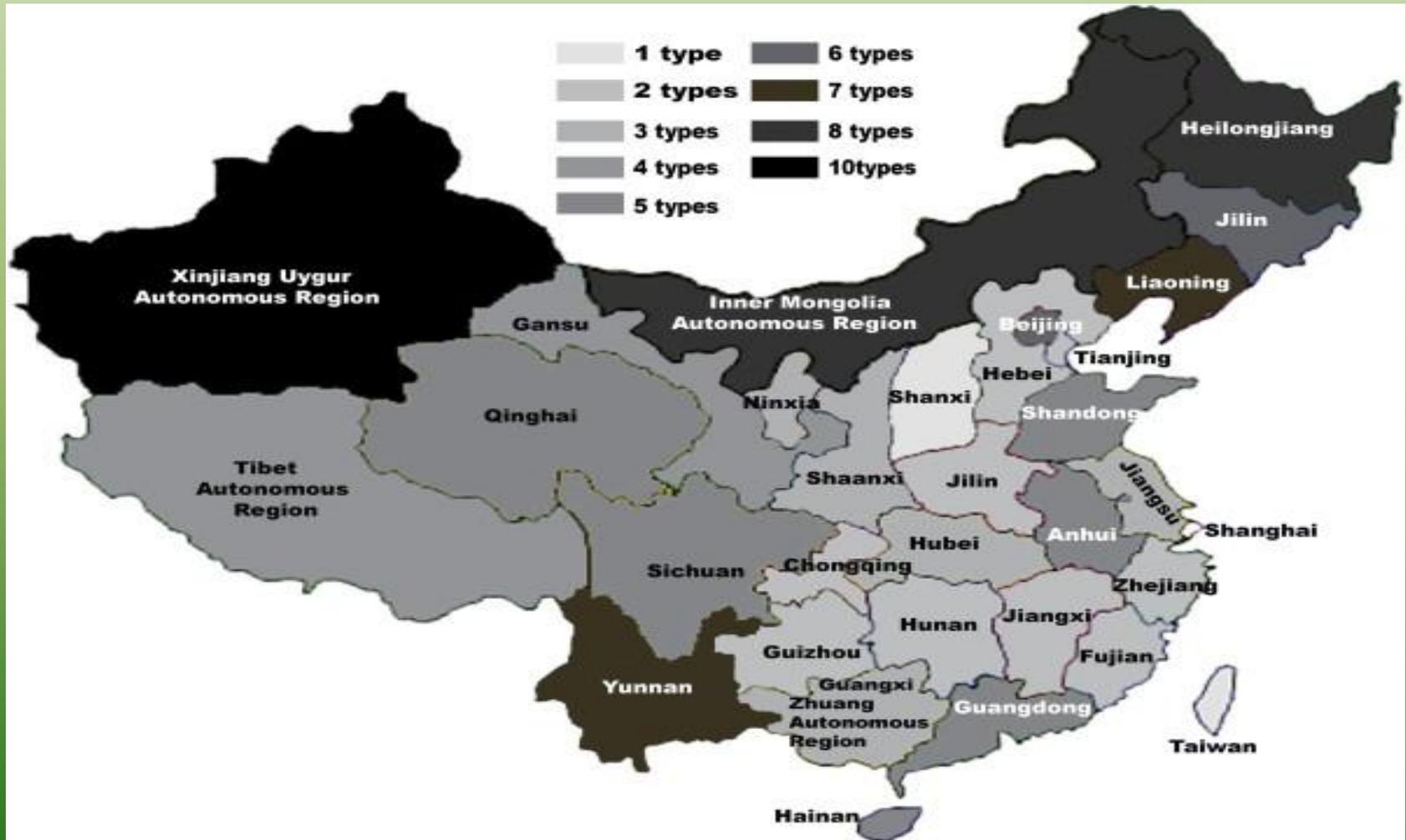
Xian-Bo Wu et al:Distribution of tick-borne diseases in China, Parasites & Vectors, 2013,6:119

Distribution of tick-borne diseases (TBD) across China

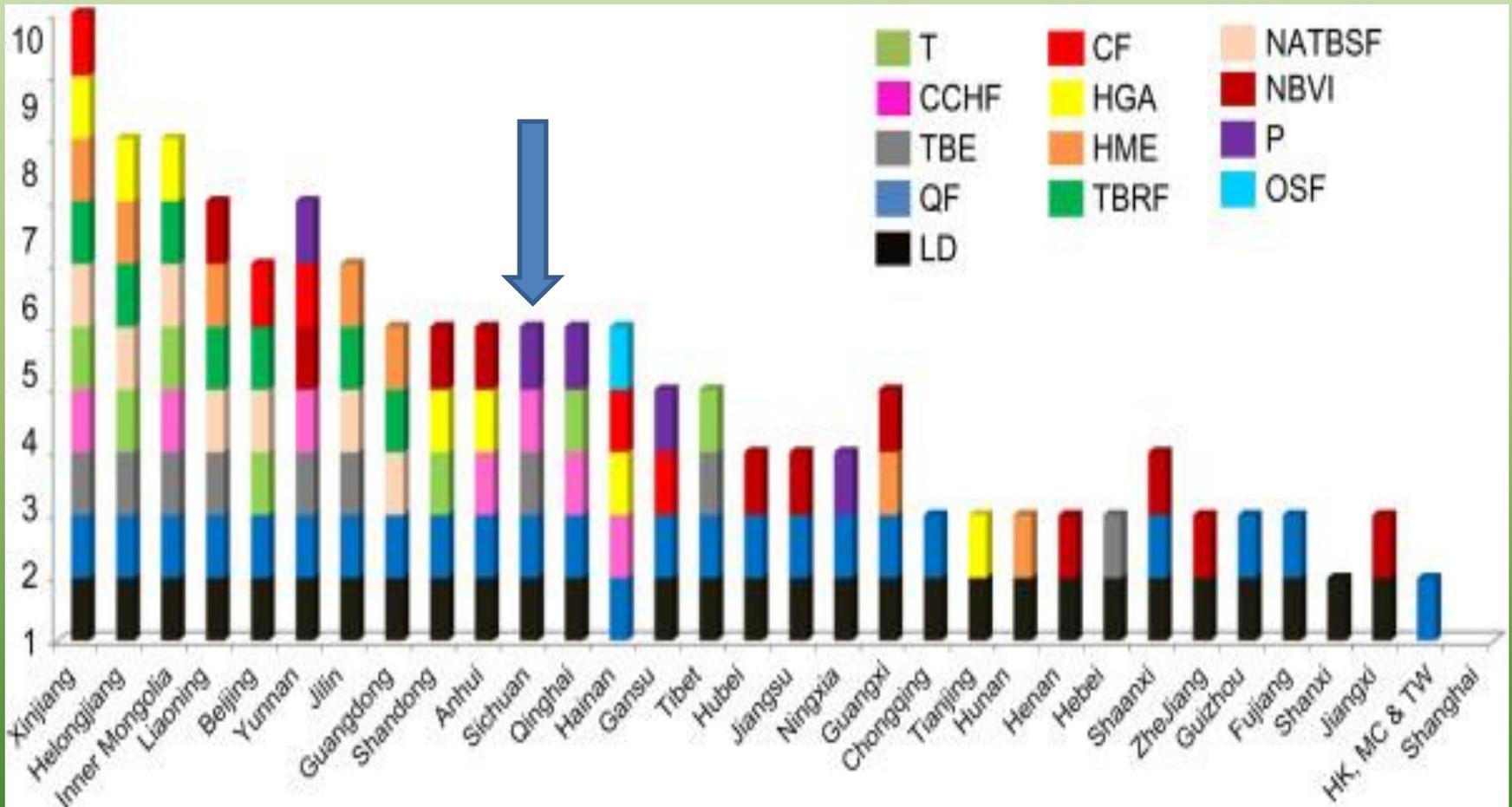


Xian-Bo Wu et al: Distribution of tick-borne diseases in China, *Parasites & Vectors*, 2013,6:119

The Frequency of TBD in China



Types of tick-borne diseases in China`s P/A/M



Xian-Bo Wu et al: Distribution of tick-borne diseases in China, Parasites & Vectors, 2013,6:119

Ixodes persulcatus, the carrier of Borrelia burgdorferi s.l. in China



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What are the differences of Lyme disease in Europe and China

- The carrier of the spirochete *Borr. burgd. s.l.* in China is *Ixodes persulcatus*, in Europe *Ixodes ricinus* and in USA *Ixodes scapularis*.
- The following slides deal with the symptoms and the therapy of an infection with *Borr. burgdorferi s.l.*. The symptoms of LD are nearly the same as in Europe, but the carrier (*Ixodes persulcatus*) is different. The ticks can be carried by different animals like mice, deer or (most often) by birds from one place (or province) to the next.

A European tick family (*Ixodes ricinus*) with its family members: Larva- Nymph- adult female and adult male tick. All except the male may transmit *Borrelia burgdorferi* s.l.

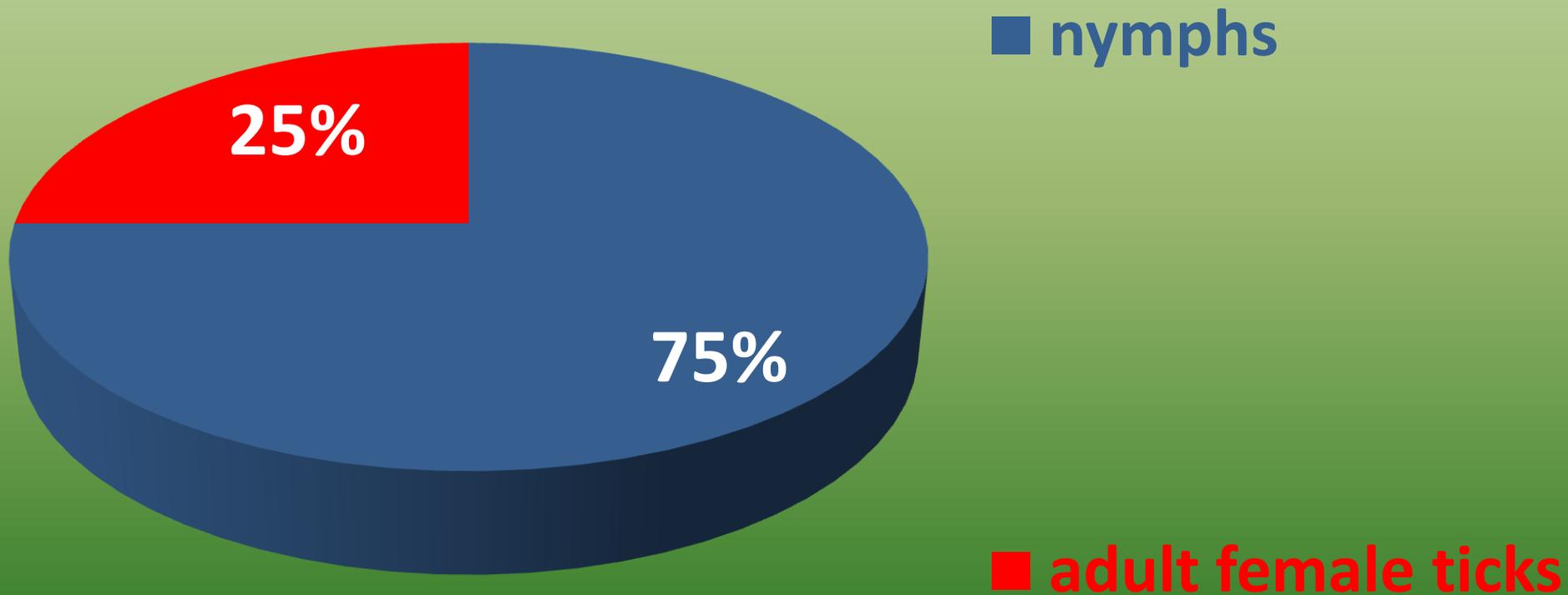


The tiny nymph of a tick is to the most transmitting *Borrelia* s.l.

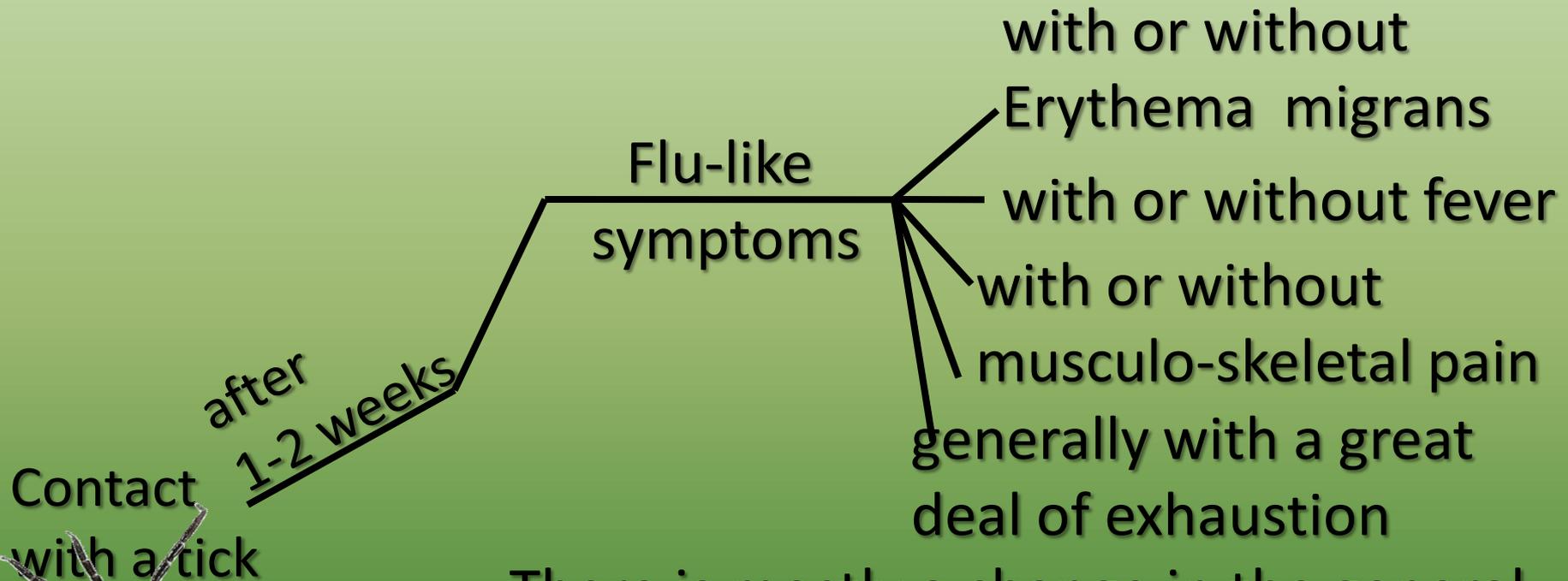


Foto: Frau Heidi Polack

Transmission rate from nymphs and adult female ticks to humans



Symptoms in early stage of infection with *Borrelia burgdorferi* s.l.



There is mostly a change in the general condition for the worse or there is a „silent period“ without any clinical sign



**Adult female tick firmly attached to
a human host with a beginning EM**

Foto: Frau Polack

Typical bull`s eye rash or Erythema migrans (EM)



© Wikimedia

If this early sign arises after a tick bite, **immediate** antibiotic treatment is necessary.

But keep in mind:

Only 40-50 % of all infected persons develop an EM

Typical bull`s eye rash (Erythema migrans)



Foto: privat

...but 13 days after the tick bite the same rash can easily be overlooked



Foto privat

A rash (EM) 10 days after a tick bite`s infection with *Borrelia s.l.*



Foto privat

The Erythema migrans can be extremely expanded , is painfree and easily overseen

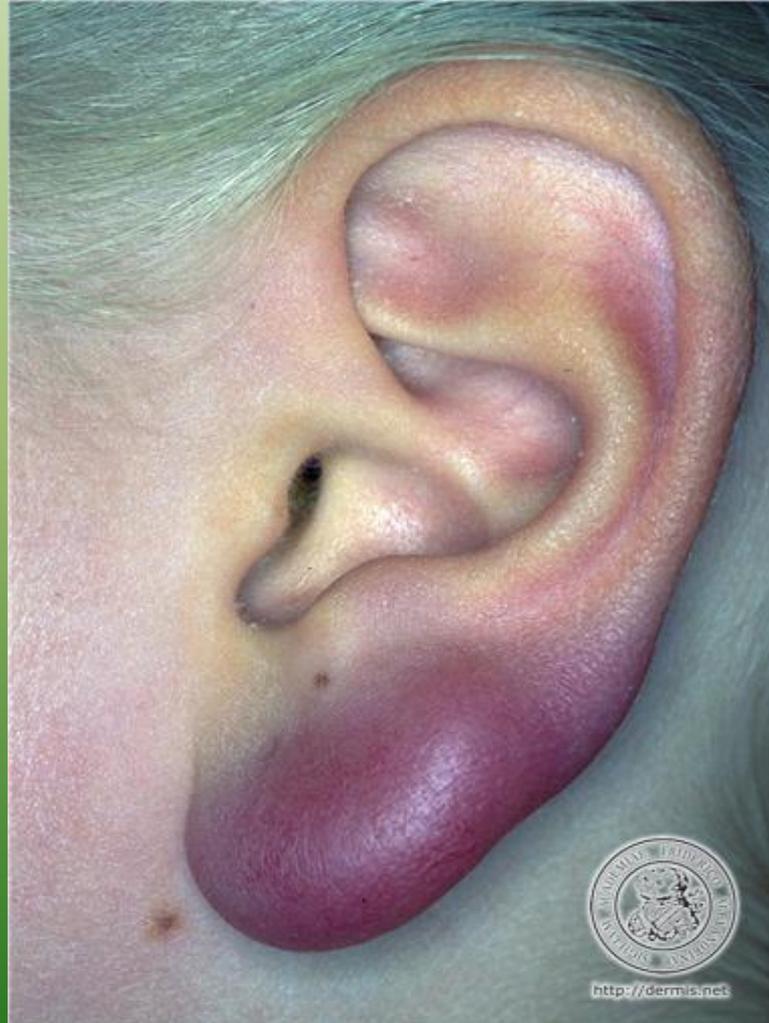


©Foto privat

Erythema migrans (EM), vaguely edged out

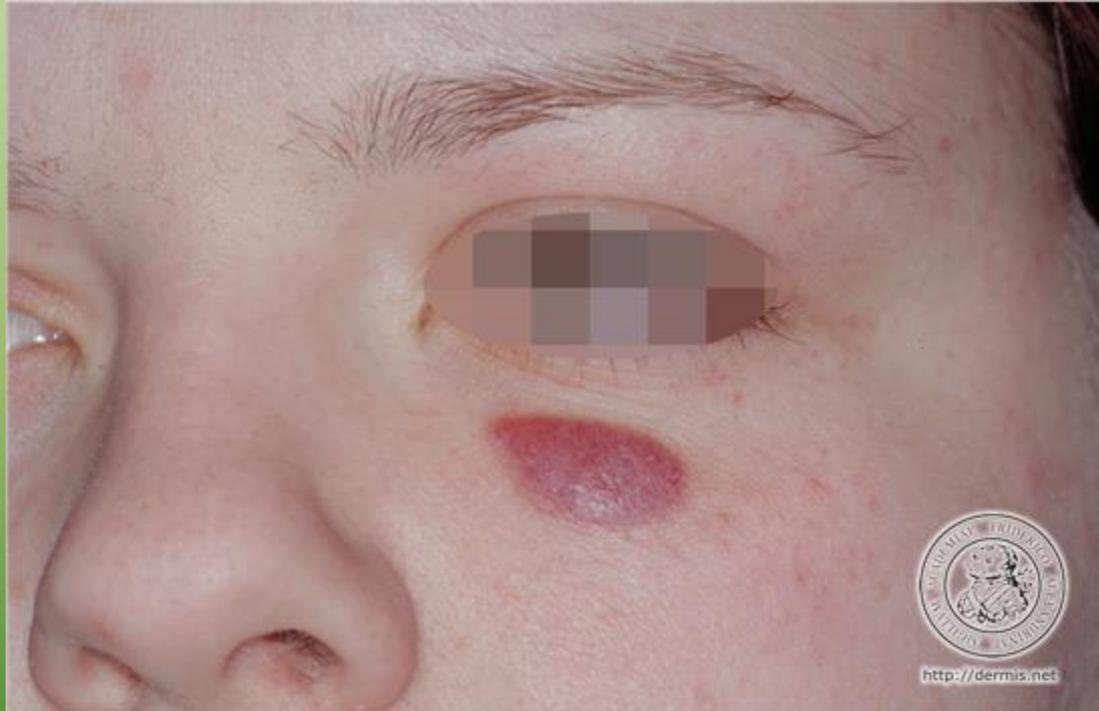


A lymphocytoma, the typical early sign of LD in children



It can develop at all areas with soft tissue like at the nipples, the cheek, the scrotum

Lymphocytoma at the cheek, a sure sign of infection with *Borrelia burgdorferi* s.l.



Clinical symptoms of Lyme Disease/Borreliosis

Exhaustive tiredness

Mental and/or cognitive
disturbances

Fatigue and
exhaustion

Multiple migrating joint
aches and joint swellings

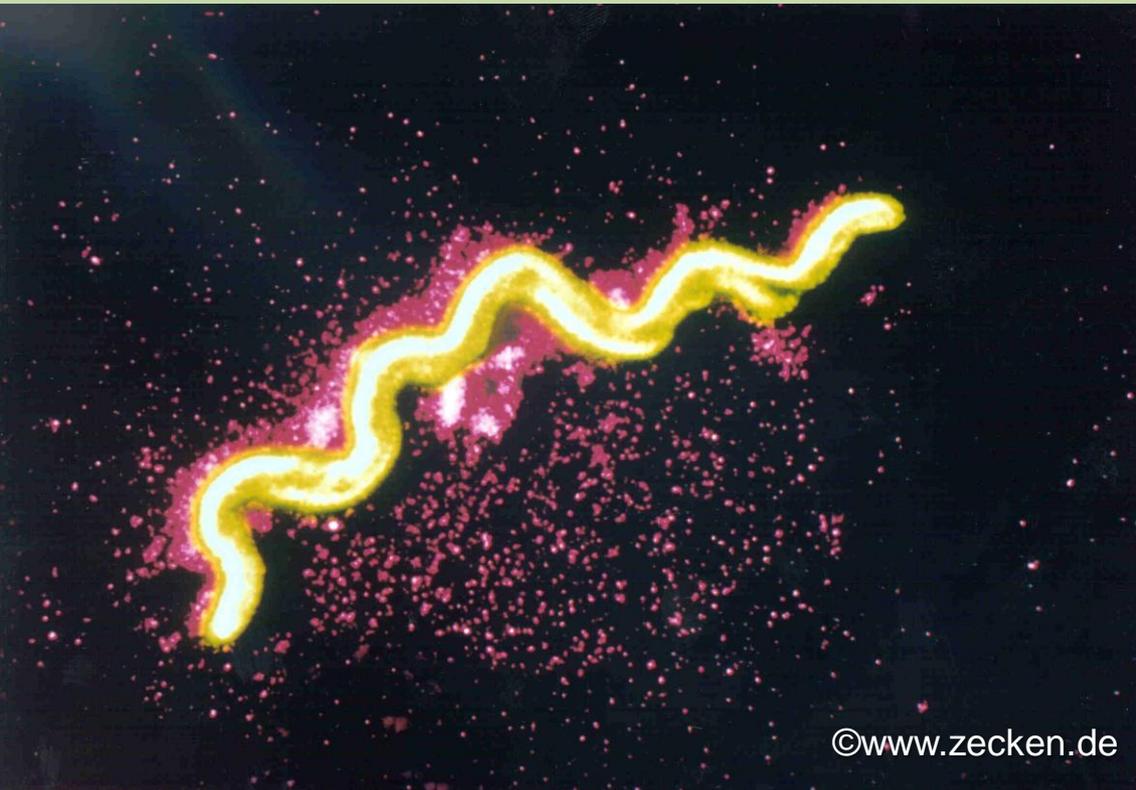
Proneness to viral or
bacterial infections

Sleep disturbances

Frequent symptoms of (chronic) Lyme Disease

- Headaches, shoulder-/neck-pain, jumping aches and swelling of joints, tendinitis and rupture of tendons without adequate trauma, myalgia
- Blurred vision, tinnitus, hearing loss
- Brain „fog“, short memory loss, impairment of concentration and learning, mood swings
- Hormonal changes for thyroid and sexual organs
- Sleep disturbances and exhaustion, fatigue

What happens after an infection with *Borrelia s.l.*

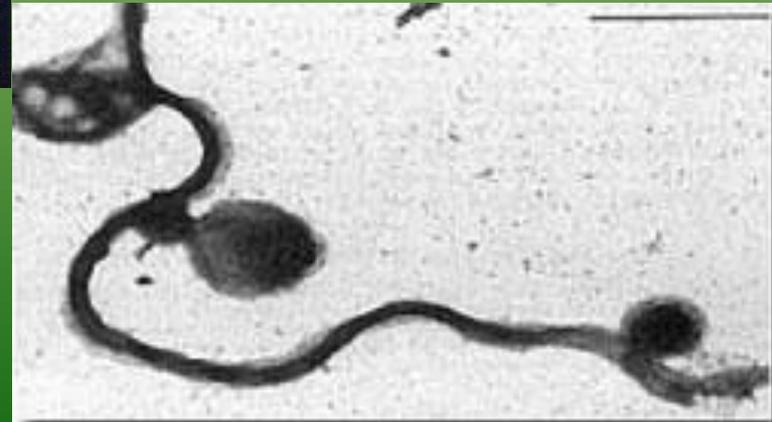


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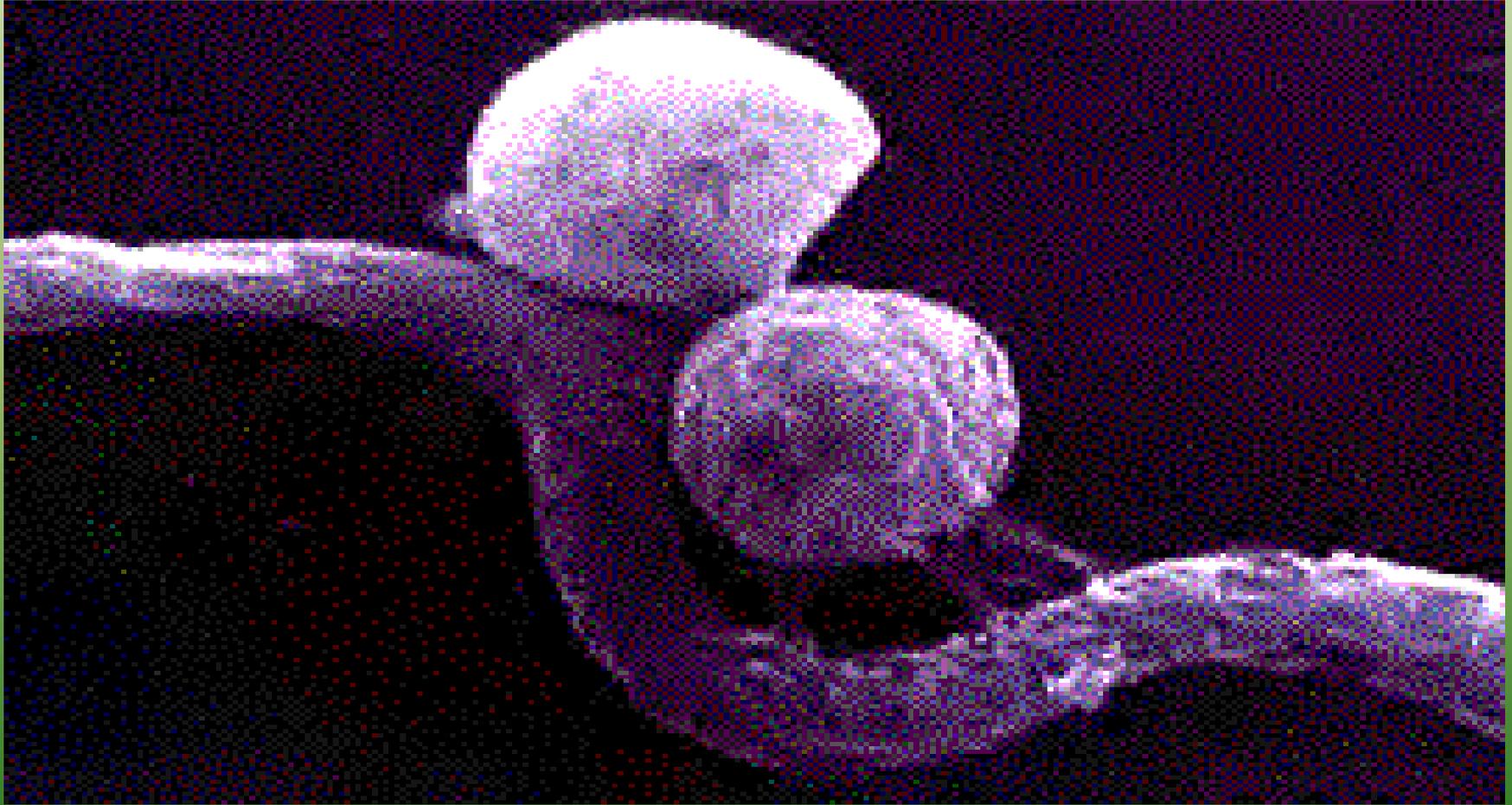
The spirochetes divide themselves every 12-24 hrs starting immediately after the host's infection. They rebuild their cell wall continuously. The lipopolysaccharides of the cell wall have an antigen effect and therefore the host's immunsystem forms antibodies (IgM, IgG).

Borrelia are able to build persistent forms, the so-called round bodies (blebs, cysts, L-forms) and biofilms. They stimulate Th 1-cytokines like TNF-alpha, IFN gamma, IL-1 beta with the consequence of a chronic persistent infection.

Chengdu 11-2015 Dr. Hopf-Seidel



The formation of cystes of *Borrelia burgdorferi* s.l. in detail



Mursic et al. 1996

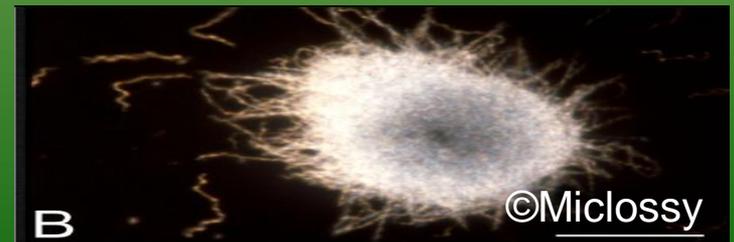
The different stages of viable *Borrelia* s.l. demand adequate treatment regimes



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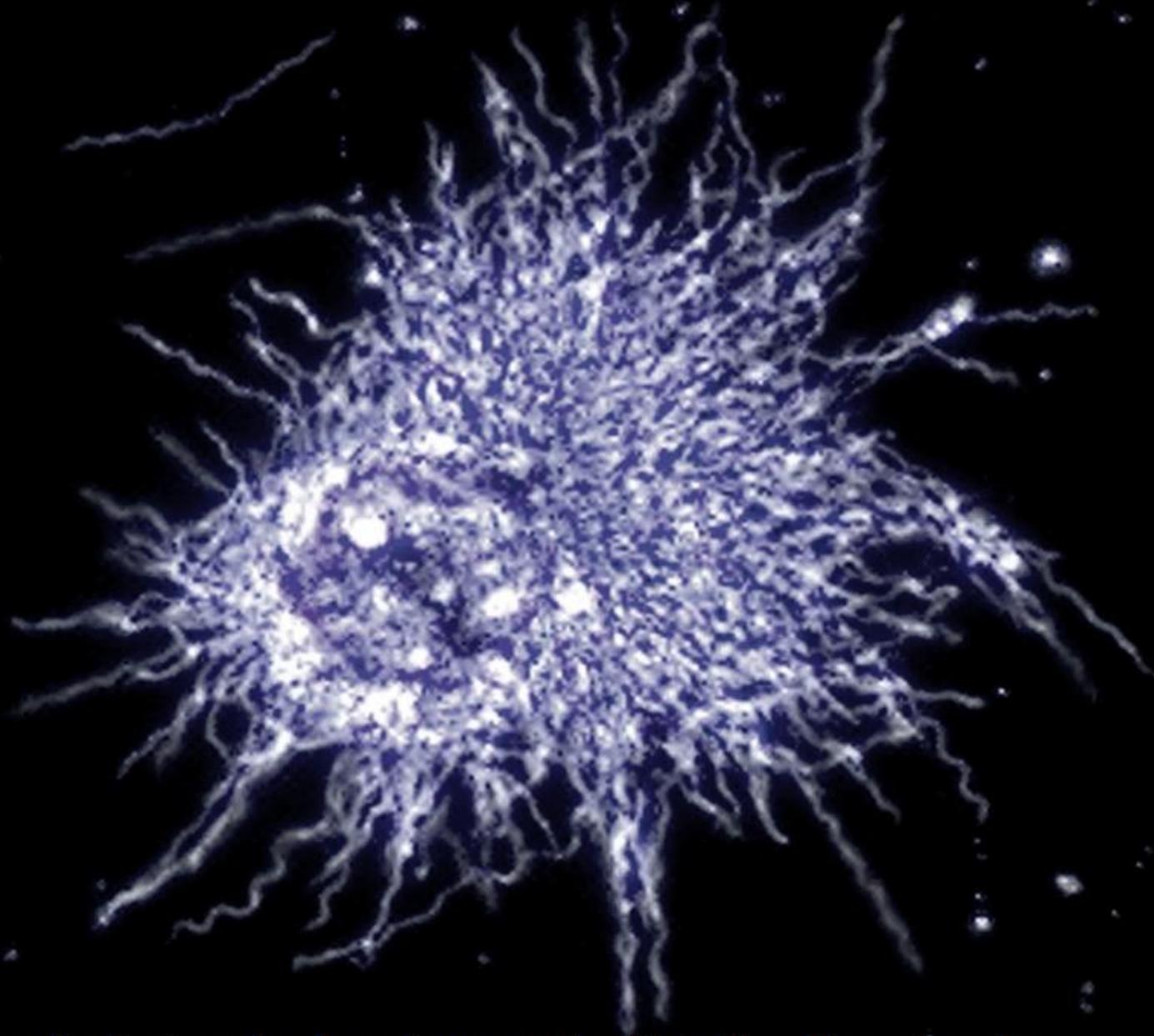
All the intracellular persister forms can be treated with Tetracyclines (best Minocyclin), or with Makrolides (Clarithromycin, Azithromycin), but always in combination with Tinidazol (Fasigyn®) or Hydroxychlor.

As long as the spirochetes divide themselves, they can be treated with cell wall synthese inhibitors like Cephalosporines (Amoxicillin®, Cefuroxim®) or Betalactames (Ceftriaxon®, Cefotaxim®) or Tetracyclines (Minocyclin or Doxycyclin)



B

©Miclossy



B. burgdorferi early development of biofilm-like structure

dark field 40X

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Treatment of early stage of Lyme Disease

- **Amoxicillin** 3 x 1000 mg for 30 days (especially for pregnant women, for children according to weight)
- **Clarithromycin** 2 x 500 mg (starting with half the dose over a period of 4 days) for 30 days for adults, weight adapted for children (7,5 mg/kg body weight bid).
- **Minocyclin** with 2 x 100 mg for patients of 50 -70 kg bodyweight (always start with only 50 mg/day and then increase slowly 50mg more every 3 days to prevent the possible side effects headaches and vertigo)

Treatment of late stage of Lyme Disease

- **Azithromycin** 500 mg- 600 mg /day for 4 days, then 3 days off because of the intracellular accumulation of the drug (generally for 6 cycles)
- **Doxycyclin/Minocyclin** should always be given in **combination** with **Hydroxychloroquine** (Quensyl[®]), **Tinidazol** (Fasigyn[®]) or **Rifampicin** (Eremfat[®], Rimpacin[®]) to prevent the formation of round bodies and **biofilms**. This combined therapy helps to reduce the number of *Borrelia s.l.* to prevent further clinical relapses.
- Biofilms are the most difficult forms of *Borr. burgd.* to be treated

This applies to our present knowledge of Borreliosis as well.....



More information you may find
online: www.dr-hopf-seidel.de or in my book



ISBN 3426873923

Thank you for your attention