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 in 1981 in the midgut of the tick *Ixodes scapularis*. To date, at least 19 species of *Borrelia burgdorferi* 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 *Borrelia burgdorferi* 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 lifes

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

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

- Human cases of Lyme Borrelialiosis 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

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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
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.
Transmission rate from nymphs and adult female ticks to humans

- 25% nymphs
- 75% adult female ticks
Symptoms in early stage of infection with Borrelia burgdorferi s.l.

Contact with a tick after 1-2 weeks

Flu-like symptoms with or without Erythema migrans with or without fever with or without musculo-skeletal pain generally with a great deal of exhaustion

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)

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)
...but 13 days after the tick bite the same rash can easily be overlooked
A rash (EM) 10 days after a tick bite`s infection with Borrelia s.l.
The Erythema migrans can be extremely expanded, is painfree and easily overseen.
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
- Multiple migrating joint aches and joint swellings
- Fatigue and exhaustion
- 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.

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.
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

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

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.

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B. burgdorferi early development of biofilm-like structure
dark field 40X
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......

Our knowledge is a drop

„Unser Wissen ist ein Tropfen, was wir nicht wissen, ist ein Ozean.“

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

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Thank you for your attention