Lyme Disease

What should you know about this disease?

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Lecture

in Aurora

Ontario, Canada

March 14, 2018

Structure of this lecture

- Frequency of Lyme Disease (LD) in Ontario, in Canada and USA
- Some facts about ticks
- Some facts about the spirochete Borrelia
- Clinical signs of early LD
- Clinical signs of late (or chronic) LD
- Diagnostic tests here and abroad
- Treatment protocols for early and late LD
- Some literature, websites, DVD`s about LD

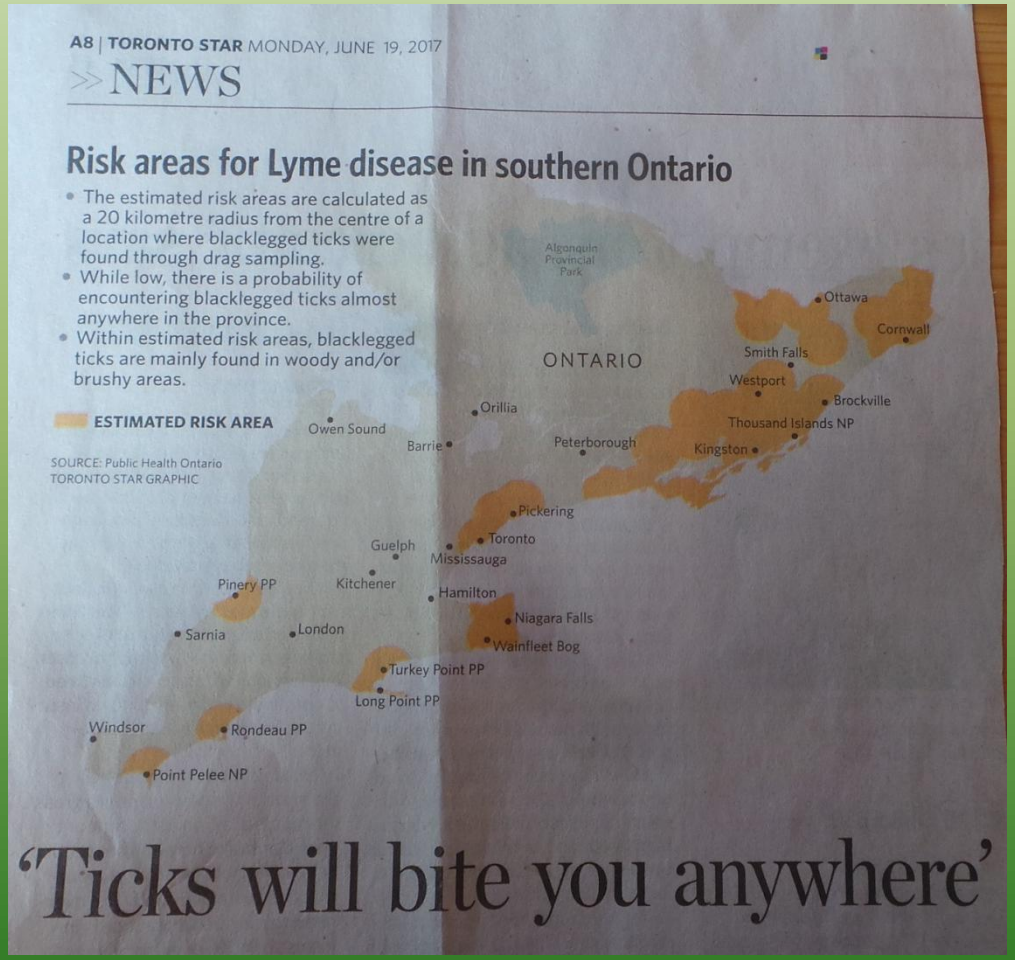
Some scientific data

35% of **the nymphs** of the blacklegged ticks (Ixodes scapularis) are infected with Bb (samples taken from **songbirds** of eastern and central Canada)

At **Kenora,** ON, **8 different species** of Ixodid ticks were carrying Borrelia burgdorferi s.l. The ticks were collected from **mammalian** hosts including **humans. 41%** of the ticks tested positive by **P**oly-merase **C**hain **R**eaction (PCR) for Bb s.l. The ticks were found ca **200 km westward** to the so far known.

73% (!) of the tick **adults** in the Lake of Woods/Kenora,ON area are infected with Bb and therefore pose the **highest risk of infection in Canada** (Mr. John Scott, M.Sc., Lyme researcher for 27 yrs)

Latest map of risk areas in Southern Ontario (June, 19,2017)



A8 | TORONTO STAR MONDAY, JUNE 19, 2017

>> NEWS

Risk areas for Lyme disease in southern Ontario

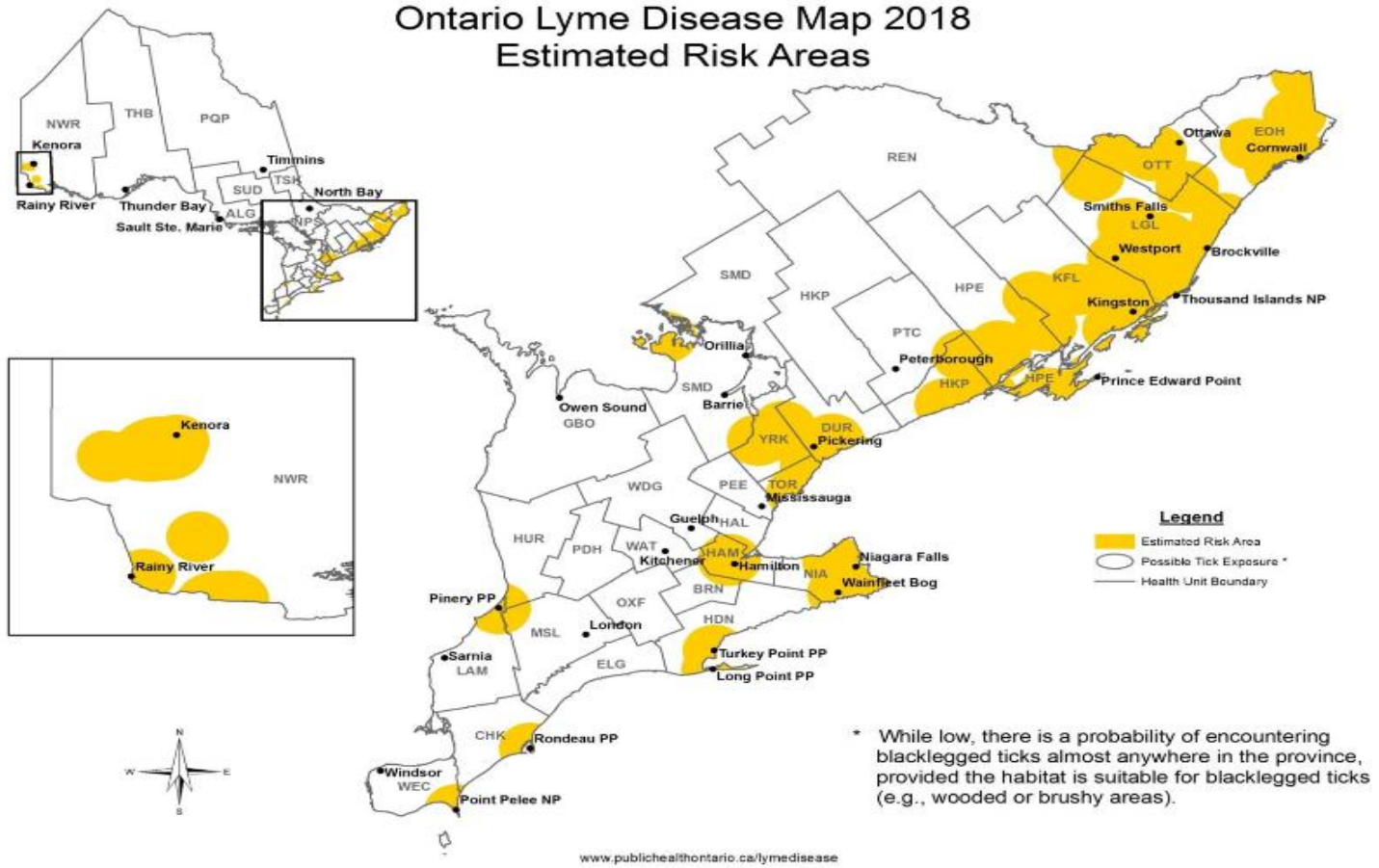
- The estimated risk areas are calculated as a 20 kilometre radius from the centre of a location where blacklegged ticks were found through drag sampling.
- While low, there is a probability of encountering blacklegged ticks almost anywhere in the province.
- Within estimated risk areas, blacklegged ticks are mainly found in woody and/or brushy areas.

ESTIMATED RISK AREA

SOURCE: Public Health Ontario
TORONTO STAR GRAPHIC

'Ticks will bite you anywhere'

Public Health Ontario | Santé publique Ontario



https://screenshots.firefox.com/5TnwRKqQM96Mcz3U/www.publichealthontario.ca

Number of LD cases in Canada

- The Saturday Sun reported on **June 17, 2017** that the Public Health Agency of Canada (PHAC) estimates, that **987 Canadians** were newly infected with Lyme Disease in **2016,** up from **682** new cases in **2013** and **144** cases in **2009.**

- But **Dr.Hawkins**, an internal medicine specialist at the Univ. of Calgary believes that the actual number is most likely **five times higher**.

Some data of LD infections from the WHO and the USA

In **2008**, the World Health Organization (**WHO**) declared „ LD the fastest spreading infectious disease, faster than malaria and tuberculosis. They called it a **world epidemic**“.

In the **USA**, the number of annually newly-infected patients has increased nearly **25-fold since 1982**.

Data suggest it may actually be over **440 000 new LD cases in the US each year.**

In Germany, in the years 2007-2009 nearly **600 000** patients per year were reported as infected to the health insurers.

Estimates of future LD cases in Canada

Migrating birds carry ticks long distances. After falling off the birds **resident hosts** such as mice, voles, deer **disperse them locally**. According to model projections, published in the Journal of Applied Ecology „the range of expansion of the blacklegged tick (Ixodes scapularis) which carries Bb is an **estimated 46 km/year** in the coming decade. This poses a substantial increase in the risk for human LD in eastern Canada. It will rise from **18% in 2010** to **82% (!!) by 2020“.**

Warning of a long time LD-researcher

“The health-care profession must be fully cognisant that LD is a public health risk“

(Scott et al., J Bacteriol Parasitol **2017**,8:1)

Is Lyme disease a rare disease?

The **conclusion** is definitely:

no, it is not rare by all means

At the moment, we only can see just the tip of an iceberg, because

- many ways of infection/transmission are generally not (yet) acknowledged like sexual, intrauterine, by blood transfusions and blood sucking insects other than ticks
- The **clinical signs** for early and late LD are **not known enough** by doctors and patients alike

Is Lyme disease a rare disease?

- The **published information** in the media is only **partially correct** (e.g. the minimum sucking time before infection occurs is sometimes much less than 24 hrs as normally reported)

- Sometimes the **results are sent back too late** by the labs for the necessary immediate treatment after infection (e.g. the results for the tick`s-DNA by PCR come back only months after mailing them to the central lab in Winnipeg)

Is Lyme disease a rare disease?

- The present **diagnostic tools are only fairly correct**. The test for antibodies (Borrelia-IgM and-IgG) are not sensitive enough and therefore many patients **with LD-infections** are **not recognised**. The immunoblot-method is (unfortunately) not in use routinelly which could give quite more detailed information about the infection time and intensity of infection.
- Many LD-sufferer are misdiagnosed as patients with rheumatoid arthritis, chronic fatigue syndrom, dementia, depression, Multiple Sclerosis (MS),Alz-heimer`s disease, fibromyalgia and sometimes even Lou-Gehrigs disease

How can Borrelia be transmitted?

The **carrier** of the spirochete Borr. burgd.s.s. is in Eastern USA and Eastern **Canada Ixodes scapularis** (or deer tick), In **Europe** predominantly **Ixodes ricinus**. The **symptoms** of Lyme Disease are **the same in Canada as well as in Europe.** Ticks are carried from one place to the next **in the blood** of **small animals** like mice, birds and very often deer. Ticks like bush and wooden areas, but **can be expected everywhere „in the green“** and with them their load of **Borrelia burg-dorferi,** the cause of LD. (This US-species is named after the Swiss researcher Willy Burgdorfer who detected the germ 1981 in the Rocky Mountains laboratories)

Ixodes scapularis, the carrier of Borrelia burgdorferi s.s. in Canada

©Zooexcurs.narod.ru

How can LD be transmitted ?

Besides the „bite“(piercing) of a tick, there are some other (scientifically proved) ways of becoming infected by Borrelia burgdorferi s.l.

1**, Intrauterine** from a newly infected mother to her fetus

2, By **sexual intercourse**, mostly transmitted from men to women

3, By **blood transfusion**, if the blood donor himself was Borrelia-infected

4, Rare, but posssible by the sting of an **other already infected animal** like horsefly, flea or lice

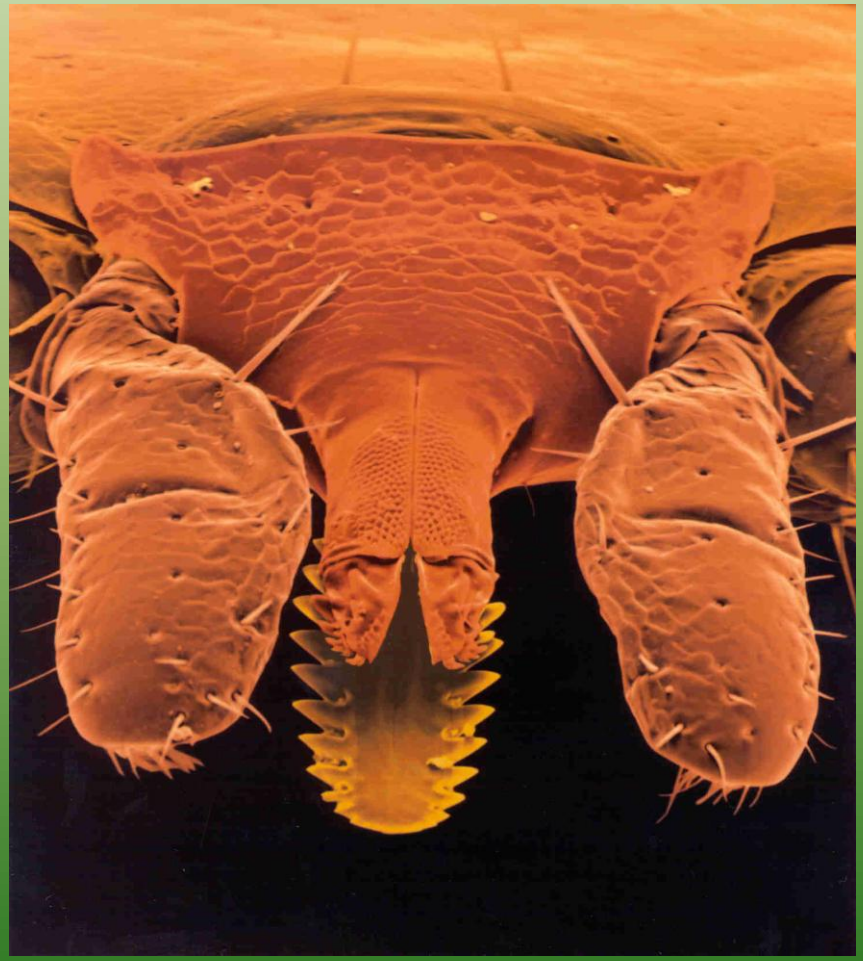
Some facts about ticks

- Infected ticks feed on small mammals and infect them by sucking blood and **regurgitating their saliva with the Borrelia into their host**. Some animals become ill like humans e.g. dogs, cats or horses, but others don`t like cows, sheep, goats, rabbits or deer.
- **Ticks** themselves **get infected** by sucking blood from an infected mammal like the **white-footed mouse.**
- Tick **saliva** contains a **local anesthetic** so that the „bite“ (piercing) will get unnoticed by the host
- **Nymphs and female adults** search for thin and moist skin areas to **pierce** into like the armpits, groin, hairy private parts, neck or behind the ears, back of knees.

Some facts about ticks

- Ticks are experts of survival, they don`t need blood for up to 2 years.They only need to **suck blood** from a host **3 times** during their **life span** which is normally **3-4 yrs**.
- They are **active** in temperatures **above 6°C.** They like moisture, no drought. They easily survive temperatures far below 0°. They can be killed by hot air such as in a dryer, but not drowned in water.
- They cannot see or bite because they don`t have **head nor mouth**, only a barbed sting (hypostome) to pierce the skin.
- Simultaneously, they can transmit **many different bacteria** like Anaplasma, Babesia or viruses likeTBE (Tick borne encephalitis) or Powassan virus.

Close-up photo of the „head“ (i.e. the mouthparts) of a tick



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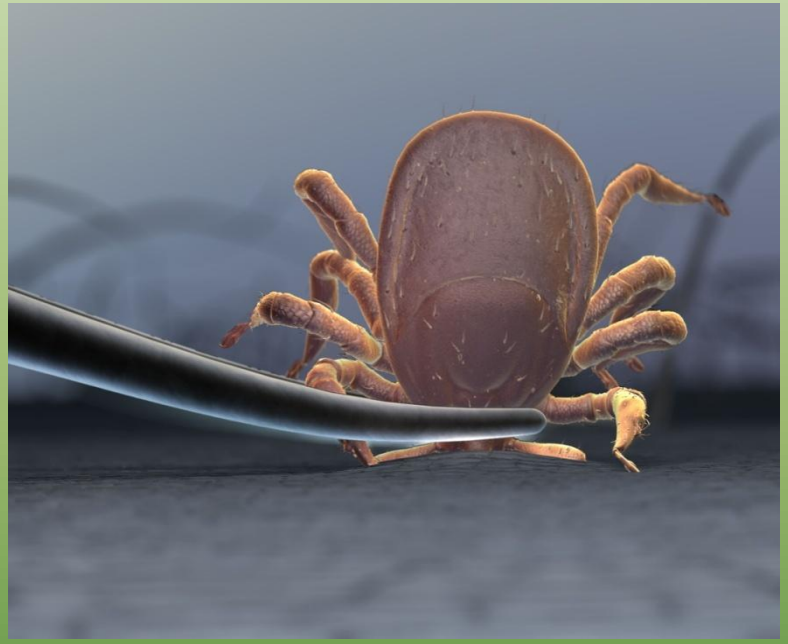
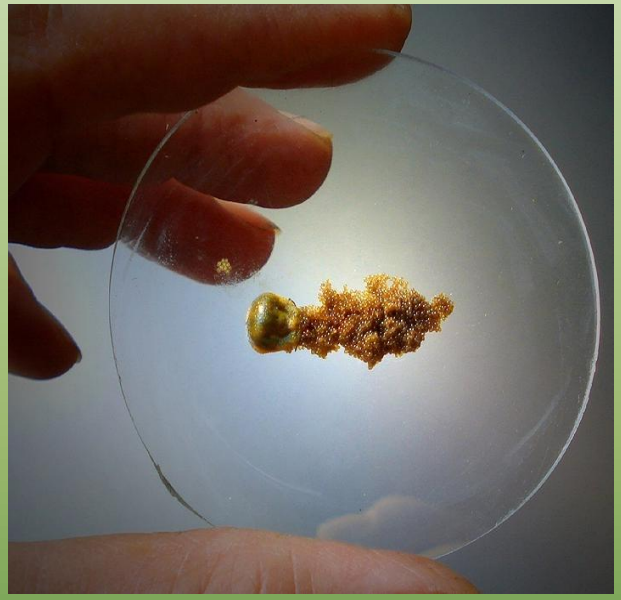
With the barbed sting(hypostome) it can „bite“(pierce) the skin of his host and suck the blood, which is needed for transformation(larva to nymph, nymph to adult female/male and a third time only for female adults to be able to lay thousands of eggs).
It cannot see, but feels vibrations and smells CO_2 with an organ in it`s pulps (Haller`s organ). So it realises an approaching host and clings to him as soon as he is close enough.

Some details about ticks



©tickremoval

Removal of a tick should be as close as possible above the skin level with the means of sharp tweezers, with a loop, a razor or even with your fingernails without squeezing the tick`s body



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Thousands of eggs from one single tick. They are able to run away as larvae immediately after being born

A new tick life starts….thousands of larvae run away from their dead mum

©polack

©polack

Some details about ticks

©bioimages Macolm Story

Female adult before and after sucking blood, shortly before laying eggs

Haller`s organ in the pulps


©polack

Hypostome

Adult female tick firmly attached to a human host with the beginning of an Erythema migrans (EM)

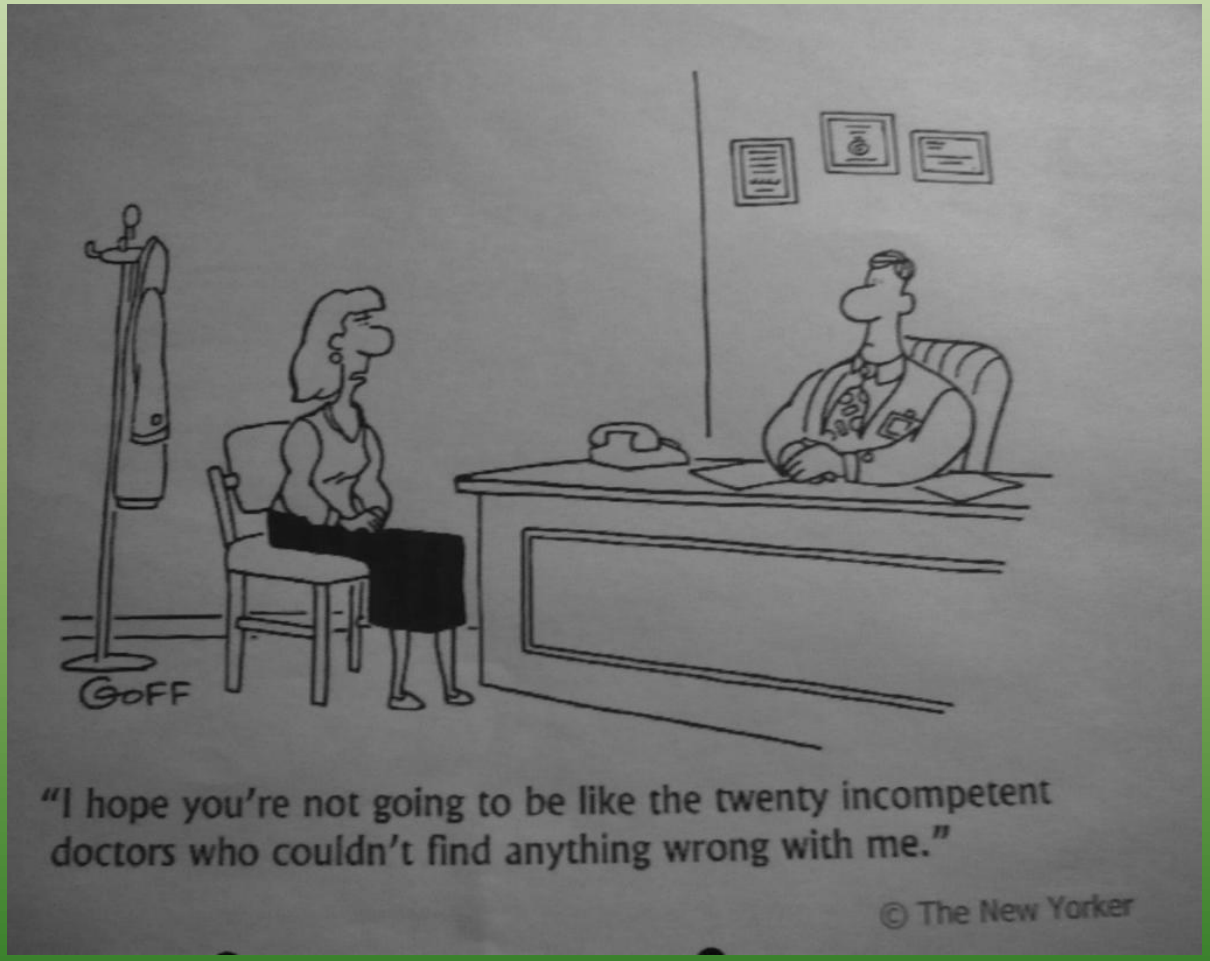
Foto: Polack

The tiny nymph of a tick („sesame seed“) is the most frequent transmitter of Borrelia s.l.

A European tick family (Ixodes ricinus) with its family members: Larva,nymph, adult female and adult male tick. All except the larva ★and the adult male★may transmit Borrelia burgdorferi and infect their host.

Foto: Polack

A LD patient seeking help…..



Let`s have a **short break** for breathing fresh air, drinking coffee or anything else you feel like…

like asking some questions

What is Lyme Disease or Lyme Borreliosis

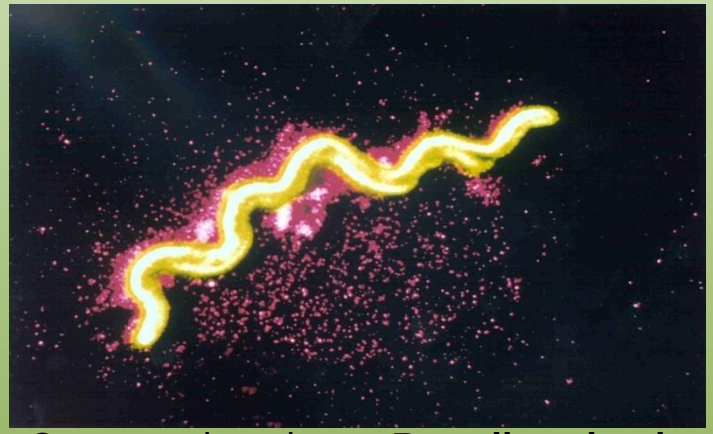
Lyme disease (LD) is a **multisystemic disease** caused by **Borrelia burgdorferi s.l**., a bacteria of the genus **spirochete,** which is a **close relative** of Treponema pallidum, the cause for **Syphilis/Lues.**

In **USA and Canada** are predominantly two species responsible for the LD-infections:

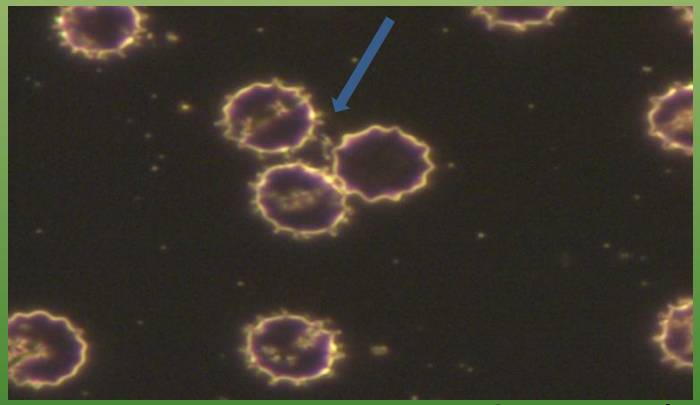
B. burgdorferi s.s. (= sensu stricto, means in Latin: in a narrow sense) and

B. lusitaniae (In Europe, there are five pathogenic species, not only two)

Spirochetes i.e. Borrelia burgdorferi



©www.zecken.de **Borrelia spirochete**



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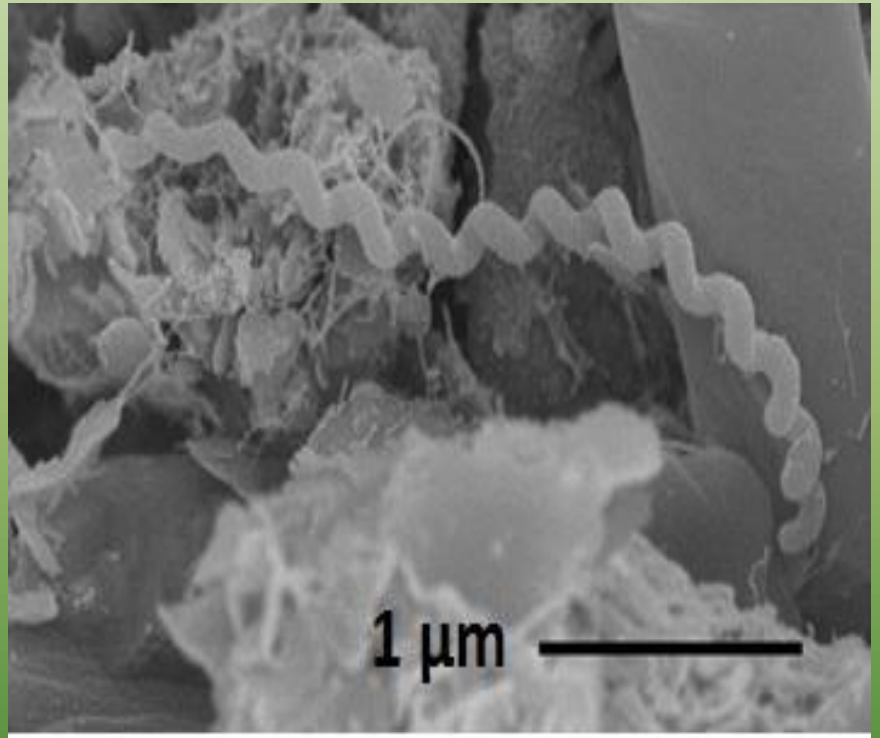
Dark field microscopy of Borrelia



Electronic microscopy of a spirochete

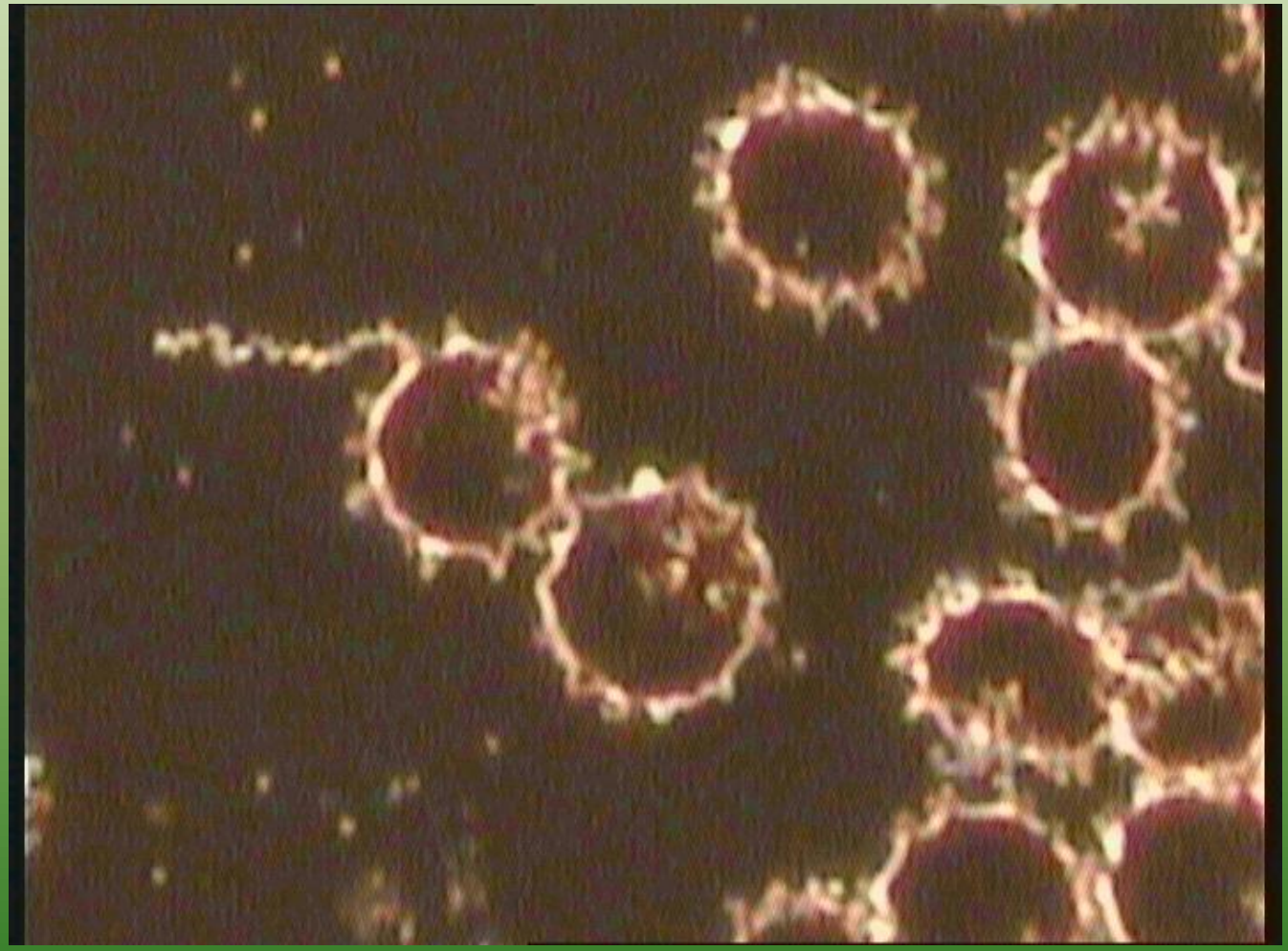
Some Darkfield Microscopy videos

Dark field Video 2.MPG

Dark field Video1.MPG

Dark field Video 3.MPG

Dark field Video 4.MPG



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Symptoms of the 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 muscle or joint pain
- generally with a great deal of exhaustion

There is mostly a change in the general condition for the worse. But sometimes there is a „silent period“, too, without any clinical signs

Get to know the signs of Lyme disease

The following slides deal with the **early signs** of an infection with the bacteria Borrelia

- The **Erythema Migrans** (EM) or **bull`s eye rash**
- The **Lymphocytoma**, an equally sure sign of infection
- The **LD-flu**, another early and definite sign of infection

Note: only 1 in 100 bitten by a tick becomes ill with LD, because a healthy immune system can deal with the Borrelia infection and contains it by antibodies and the other immune defense methods. **Ticks should be checked by PCR for Borrelia as only ca. 40% contain the bacteria!!**

Differences between Europe and Canada in detecting Borrelia in ticks

- In **Europe**, a **PCR for the DNA** of Borrelia in ticks costs 30-40 € (ca. 55 C$) for the patient and comes back to the sender **within 3 days**.
- In **Canada**, the tick will be sent by the local health unit to a central laboratory (Winnipeg) and **comes back 2-4 months later** to the health unit and only after then the bitten Canadian patient will get to know about the result. That means the very important early time for treatment after the bite of an infected tick has already long passed by .

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

© Wikimedia

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

But keep in mind:
Only 40-50 % of all infected persons will develop an EM !

Classical bull`s eye rash (Erythema migrans) at a typical location

…but only 13 days after the tick bite, the same rash can easily be overlooked as it wanes

A rash (EM) 10 days after the tick bite, a sure sign of being infected by Borrelia

Early Erythema migrans , but not in a bull`s eye shape

Early Erythema migrans on June, 25, only two days after a tick bite on June, 23, 2018

Slightly increased on June, 26, 2018

Steadily increasing until June, 28,2018

Therapy starts with Minocyclin on June, 27, 2018

Still increasing EM, but waning centrally till July, 1, 2018 during antibiotic therapy

Hardly visible EM on July, 5, 2018 because of continous antibiotic therapy

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

©Foto : Dr. Hopf-Seidel

A developing Eryhema migrans (EM) three days after a tick bitewithout a sharp ringform

The same EM on day four after the tick bite even more waned out

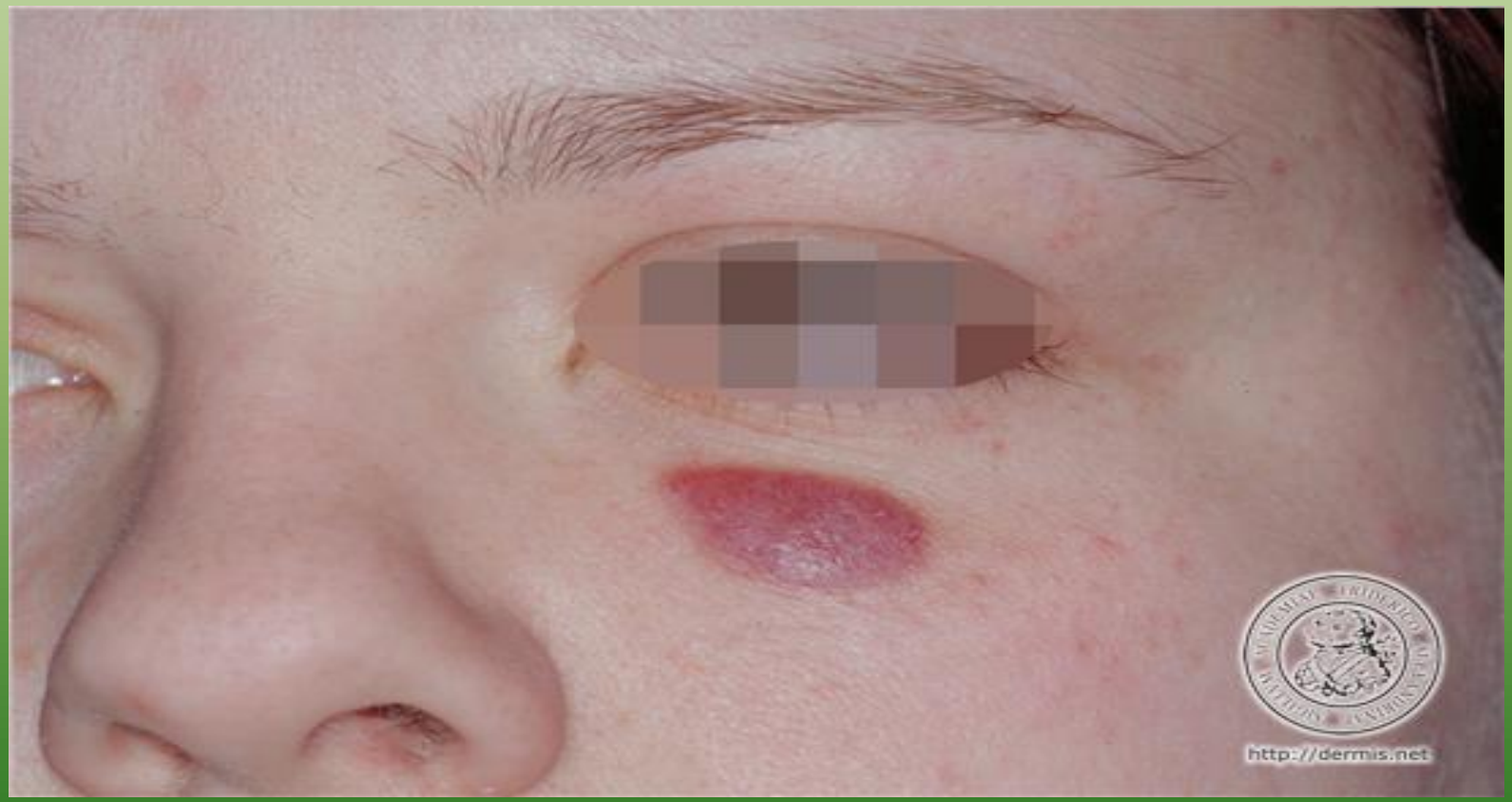
Erythema migrans (EM), vaguely edged out

Erythema migrans at the elbow

The lymphocytoma, another typical early sign of LD, mostly in children

It can develop at **all areas with soft tissue** like at the ear lobes, the nipples, the cheek and the scrotum

Lymphocytoma on the cheek of a child, a sure sign of infection with Borrelia



Other clinical signs besides an EM of the early Lyme disease infection

Flu-like symptoms (but without a running nose)

like

- Headaches, joint pains, muscle pain, fever, heart beat irregularities, light sensitivity, impaired hearing, tinnitus
- Tiredness and easy exhaustion, sometimes with the need to lay down in bed for days
- Feeling unwell without a clear reason and/or being depressed
- Any change in the physical or mental/psychological condition after a tick bite which stays on for days

Some facts you should know about a possible infection with Borrelia

- Not every tick „bite“ causes a Borrelia infection as only **35 %** (to max.73 %) of ticks **are infected** themselves with the germs
- The tick needs some hours -between **4 to 12 (!) hrs** - to feed on the host to be able to transmit the bacteria
- The immune system of the host is the most important fact,if an infection can take place or not. **Healthy individuals** without further strains like heavy metal burden, electrosmog or chemical sensitivity etc. **can handle a Borrelia infection** and no symptoms will arise („dormant infection“). Nevertheless, a relapse can allways happen with all the typical symptoms of late LD, even after years.

Important preconditions for the clinical diagnosis of LD

The probability of being infected with Borrelia after a tick bite is all the more likely if **more than three** of the clinical symptoms described in the following slides are present in the time thereafter.

The **clinical history** and the **combination of symptoms** have a higher significance in detecting LD than the lab results which might or might not support the diagnosis.

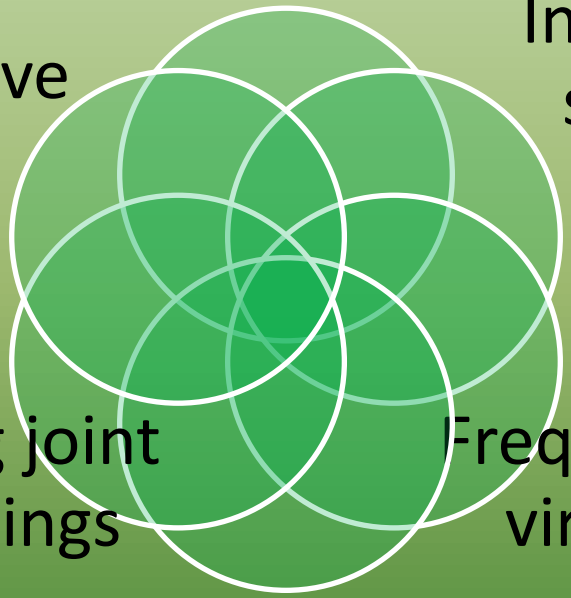
Even with non-conclusive antibodies and/or immuno-blot results someone can still be suffering from LD!

Clinical symptoms of chronic Lyme Disease/Borreliosis

Exhaustive tiredness

Intense fatigue, night sweats ,heart beat irregularities

Mental and/or cognitive disturbances



Multilocular migrating joint aches and joint swellings

Frequent infections with viruses and bacteria

Sleep and hormone disturbances

Symptoms of the central nervous system (CNS), mostly in chronic cases

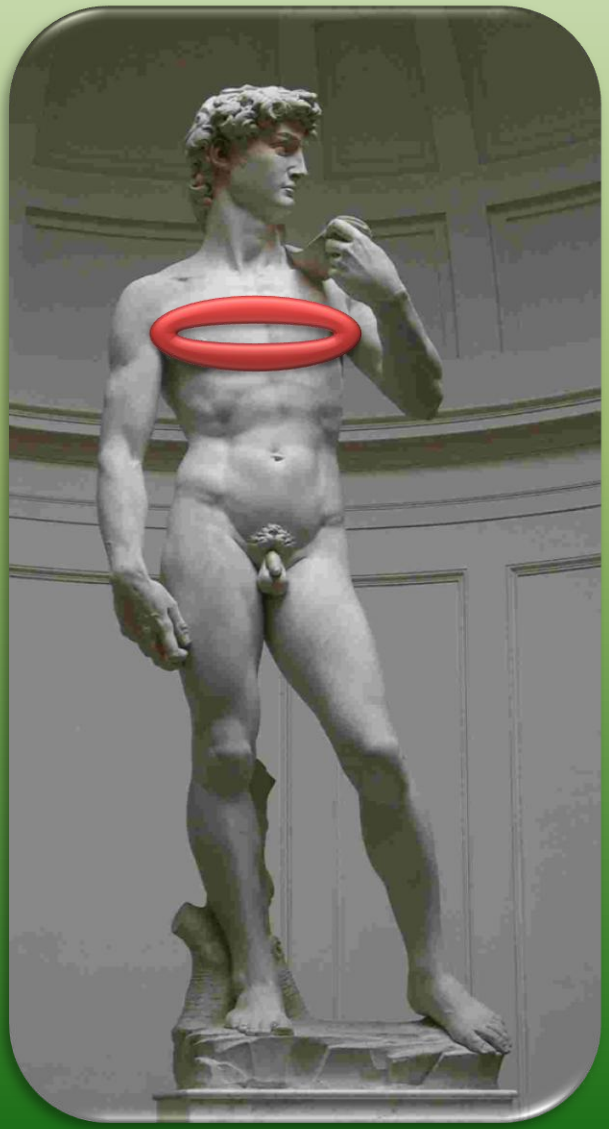
- Frequent headaches, diffuse, often one-sided or like a cap around the head
- Neck-shoulder pains with stiffness or muscle pains or cramps
- Pain of the scalp when combing one`s hair
- „Brain fog“ and light-headedness
- Forgetfulness, poor short-term memory, difficulty with concentration, with speech or writing

Irritations of the cranial nerves (CN)

The most affected ones are:

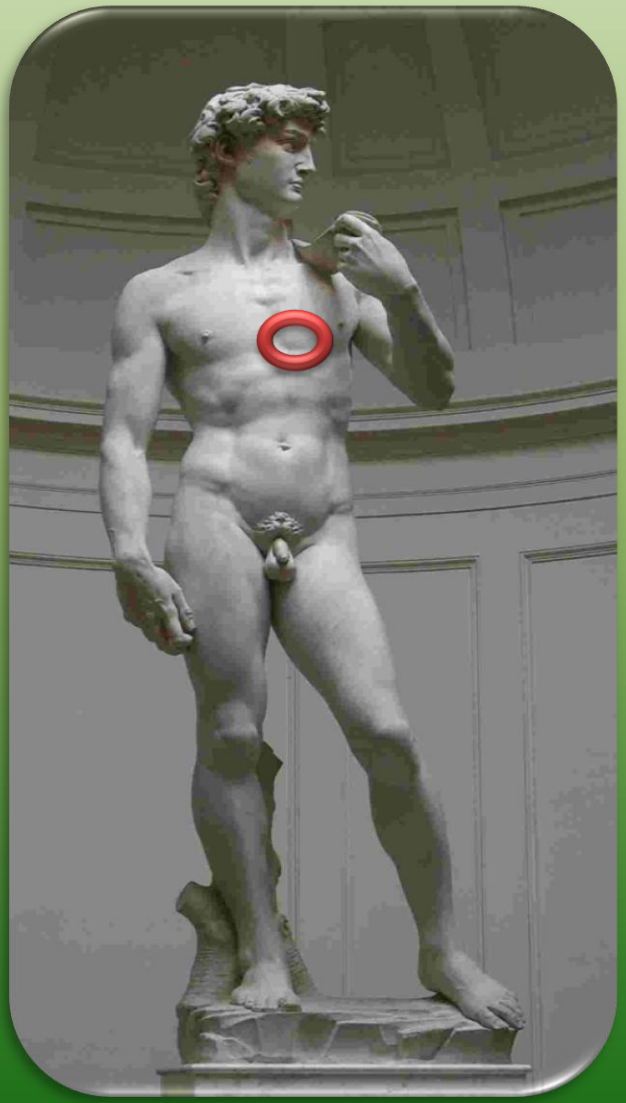
- **CN 2 (blurred vision on and off)**
- **CN 3 (double vision, light sensitivity),**
- **CN 5 (pain in the cheeks, „tooth“pain because of a transferred pain of the trigeminal nerve)**
- **CN 7 (Facial paralysis, sometimes both sides at the same time, especially in children!)**
- **CN 8 (Poor Balance disturbances and ear symptoms like loss of hearing, tinnitus, ear pain, dizziness and vertigo)**

Symptoms of the rib cage



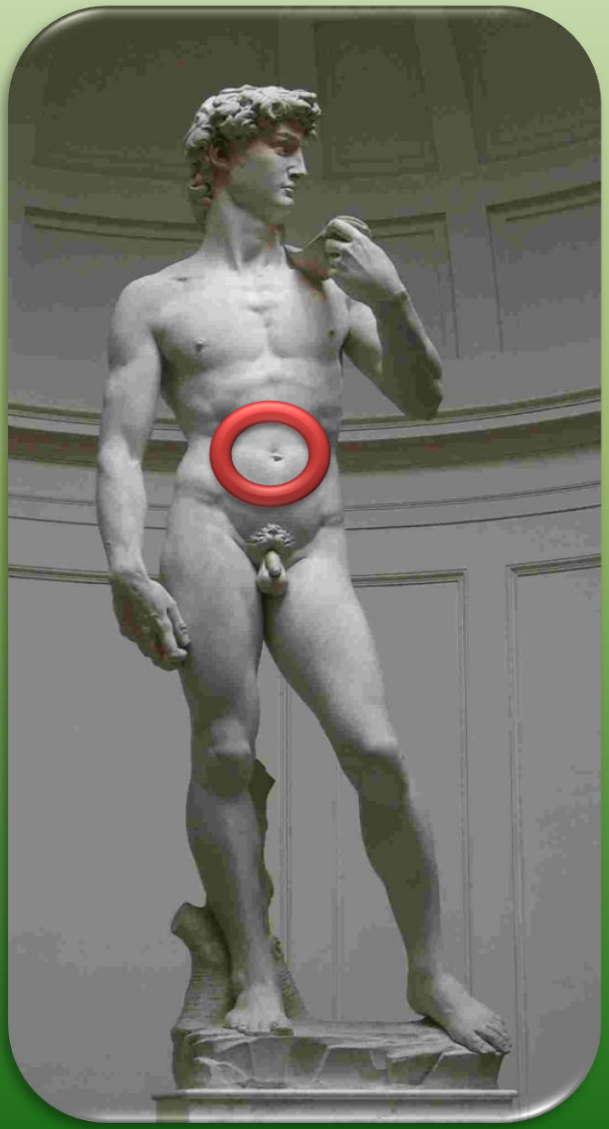
- Dry and constant cough without phlegm or signs of infection
- Shortness of breath, even more after only slight physical exertion
- Soreness of the ribs, especially along the breastbone (like an open wound)
- Feeling of pressure on the rib cage, sometimes associated with chest pain and problems with breathing

Symptoms of the heart



- Heart beat irregularities (tachy-cardias, pulse skips, heart blocks like AV-block I-II)
- Heart palpitations and murmurs
- New onset of high blood pressure, mostly with elevated diastolic values > 90 mmHg
- Myocarditis with or without effusion
- Pericarditis

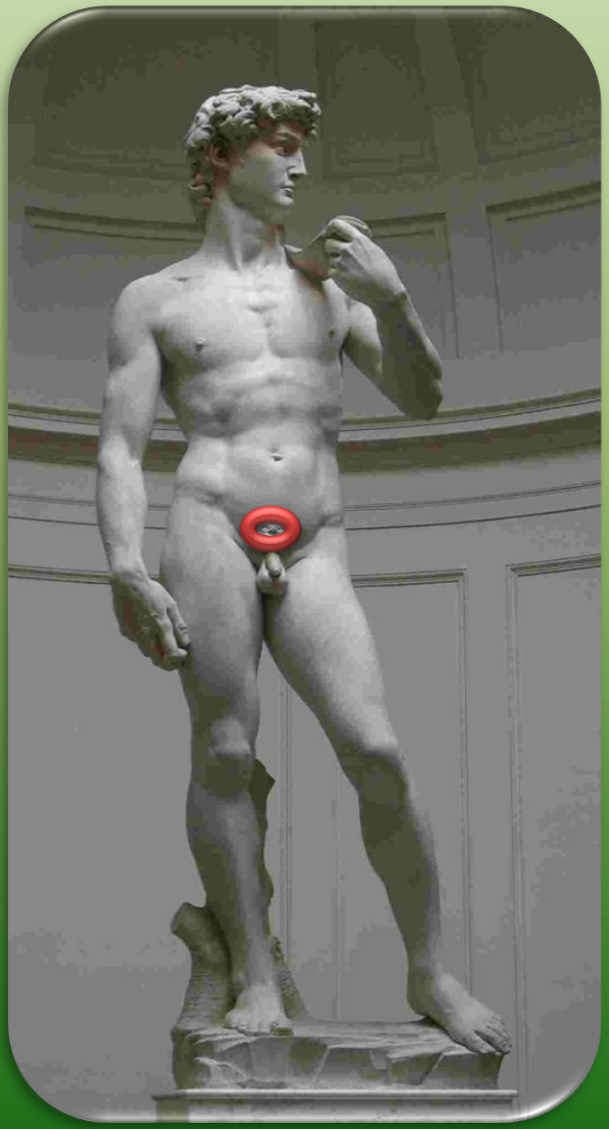
Symptoms of the stomach and bowels



- New onset of moderate elevated liver values (mostly normalising under antibiotic treatment)

- Bowel cramps, flatulence, irregularities of the bowel movements (diarrhea, constipation)
- New intolerance against alcohol
- New food intolerancies
- An upset stomach without reason

Urogenital symptoms

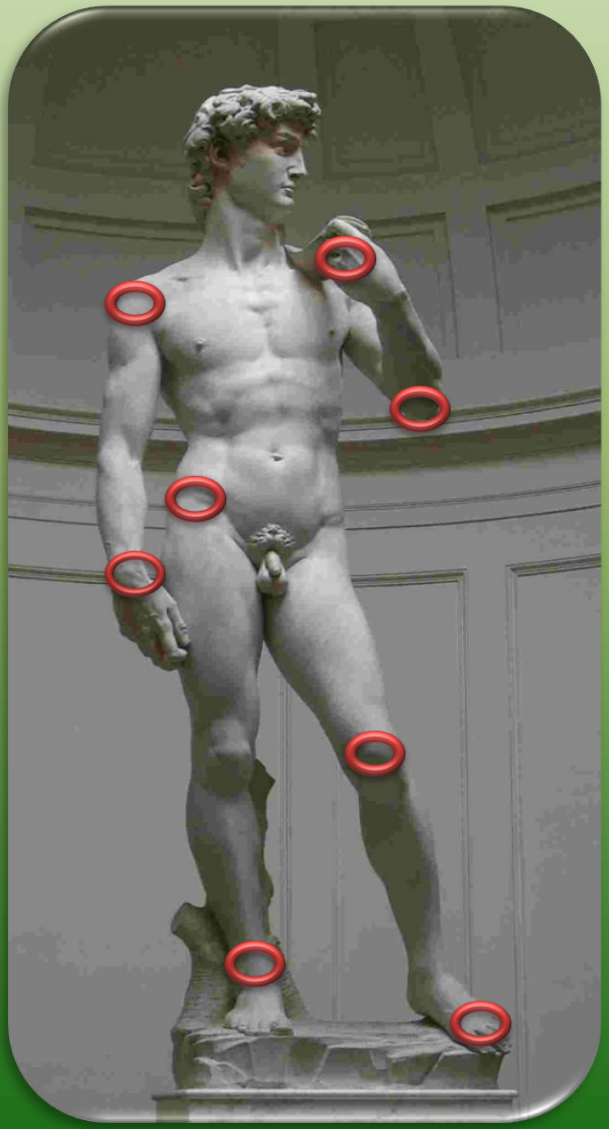


- Burning of the bladder/urethra without any bacterial findings

- Irregularities in passing urine like too often, too little amounts, incontinence or sudden urge

- New onset of nycturie (passing urine very often at night) or polyurie (too often daytimes)
- Loss of libido in both sexes and weak potency in males
- Irregularities of the menstrual cycle

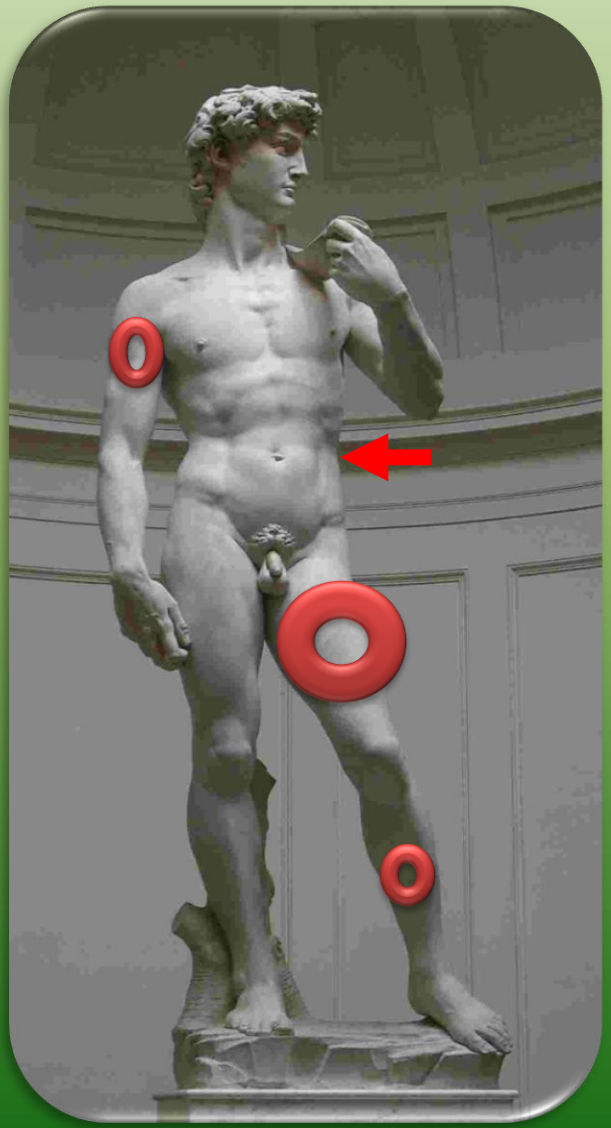
Symptoms of the extremities



- Multiple, jumping and changing pains in the big joints, intensified at night
- Pain in both shinbones at night (a very typical sign!)
- Swellings of the toes and /or the fingers
- Muscle pains or cramps, twitching of muscles all over the body and face

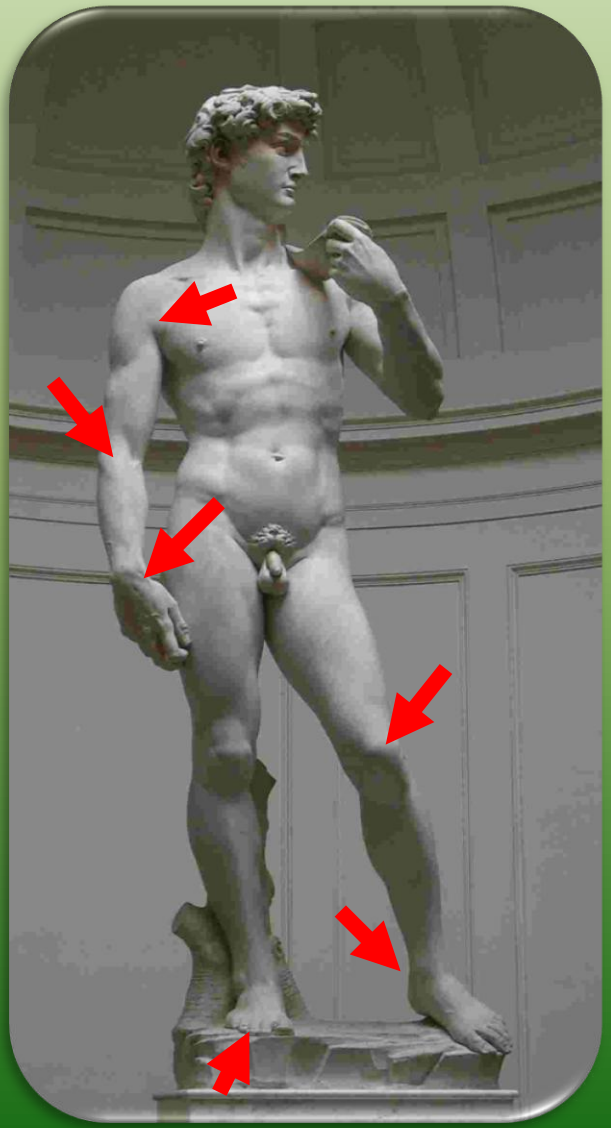
But: All lab results for rheumatism or inflammation are normal!

Symptoms of the muscles



- Spontaneous aching of muscles without prior exertion (but with elevated muscle enzymes like LDH, CK)
- Sudden stabbing pain in the thighs with risk of falling
- Muscle pain and exhaustion for days, even after only a moderate exertion
- Different muscles are aching without any reason for it and the pain`s location is changing everytime

Symptoms of the sinews



- Inflammation, swellings and pains at different sinews like
  both Achilles tendons (very often),
  tendons of the elbow
  pain at the sole of the foot (plantar fasciitis)
- Carpal tunnel syndrom (CTS)
- Spontaneous ruptures of the big sinews like the Achilles tendons or the tendons of the thighs (tendon of the M. quadriceps)

A typical, but rare symptom of the skin in chronic LD

Acrodermatitis chronica atrophicans (ACA)

There are three stages in **ACA**:

I Stadium maculosum with scaly **reddish skin** changes

II Stadium infiltrativum with **swelling** of the fingers or toes and foot

III Stadium atrophicans with so-called **cigarette paper skin**

Mostly seen is stage I and II, but often mistaken for an arthritic or vascular symptom of hand or foot.

Nevertheless, with adequate antibiotic treatment stage I and II (but not III) is still reversible.

ACA (Stadium II) of the right hand

Acrodermatitis Chronica Atrophicans (ACA)

Stage III with cigarette-paper skin without any subcutaneous layers and without elastic fibers.
This stage is **not reversible** anymore and quite rare (only **2%-10%** of all LD-cases).
The legs are more often affected than the upper extremities.

Some other symptoms of chronic LD

- **Hormone irregularities** like deficits of Thyroid hormones, low Serotonin with depressive mood swings, low Melatonin with sleep dis-orders, low ADH with low specific weight of urine and polyuria.
- **Weight** gain or loss without any explanation
- Unexplained **fevers, night sweats**, chills or flushing cheeks as well as **swollen glands**
- Unexplained **hair loss**
- **Cracking of joints** and many more symptoms

For more details see: www.dr-hopf-seidel.de/symptoms

This applies to our present knowledge of Lyme disease and its diagnostic as well……

Laboratory tests for LD

Tests for IgM-and IgG-antibodies against Borrelia

These tests are known to be inaccurate as the **sensitivity** is only about **60%-80**%. This means that **20-40% of positive LD-patients are missed.**

Furthermore, the tests can differ from lab to lab, as every lab (at least in Europe) uses its **own test kits**.

If the results are positive, it only says that the patient has had contact with Borrelia and his immune system has produced antibodies against it, but it **doesn`t say anything** about the **activity of LD.**

Laboratory tests for LD

Immunoblotting or Westernblotting allows to determine the specificity and durartion of a Borrelia infection (e.g. **p 100, p 39, p 89** are highly specific for **a late LD** and **VlsE, OspC** for a **recent LD infection**).The p41- band is not specific as it only shows the contact with a bacteria with flagellae (long filaments for moving around).

Elispot or LTT (Lymphocytes transformation test). They both show the cellular answer of **T-lymphocytes** of the immune system to Borrelia germs.

Laboratory tests for LD

They **Elispot and LTT** represent the **activity of a LD** and are the most valuable in determing the necessity of antibiotic treatment. If they are **positiv,** but the clinical signs and/or the medical history is not clear enough, then antibiotic **treatment is recommended**.

These tests react already 10 days after the infection took place,long before the **antibodies** are produced by the immune system, which takes **normally 4-6weeks**.

But it is presently not avalaible outside of Germany.

Laboratory tests for LD

- **Dark field microscopy** is an old method to observe spirochetes directly under the microscope. A century ago, it was used for diagnosing Syphilis by observing the bacteria Treponema pallidum. It is a very helpful method in **seronegative cases** and for a **follow up** during treatment periods.
- The **CD 57+-NK-cell test** helps to determine if the immune system is under stress as it is because of the chronic infection, but it is **not specific for LD.**
- **PCR** tests and **culture** are not sensitive enough, so they are not used in the daily routine.

Treatment principles

- A **newly** acquired Borrelia infection can be treated with **extra- or intracellular** effective antibiotics.
- A **late** Borrelia infection can **only be treated** with a **combination of intracellular** effective antibiotics.

The reason for it is the fact, that Borrelia spirochetes tend always to **hide intracellular** and furthermore in **biofilms** which makes it quite difficult to reach them with antibiotics. Even the immune system cannot detect Them, if they hide intracellularilly. This is the **reason for relapses** and **ineffective treatment protocols**. Each treatment period has to be at least for **30 days**!

Treatment of early stage of Lyme Disease

- **Amoxicillin** 3 x 1000 mg for 30 days (especially for pregnant women, for children < 8 yrs, always adapted to their weight)

- **Clarithromycin** 2 x 500 mg (starting with only half of the dose over a period of 4 days) for 30 days for adults, for children adapted to weight (7,5 mg/kg body weight, bid).

- **Minocyclin** with 2 x 100 mg for patients of 50 -70 kg of body weight (always start with only 50 mg/day and then slowly increase 50mg more over every 3 days until 2 x 100 mg . This prevents the possible side effects headaches and dizziness).

Treatment of early stage of Lyme Disease

Doxycyclin has become lately a second line antibiotic. For a patient of 70 kg, a dosage of **400 mg/day** would be necessary, for obese patients even more. But this dosage is not well tolerated anymore and **gastrointestinal side effects** are quite common as well as a **phototoxicity**.

Furthermore, studies by Prof. Sapi, Univ. of New Haven, have shown that **Doxycyclin** causes **Borrelia to hide intracellular** quite quickly and drives the germ to build **persisters.**

Treatment of early stage of Lyme Disease

Ceftriaxon/Rocephin is reserved for really bad cases with f.e. paralysis of limbs or the facial nerve. In such cases, it has to be given i.v. for **28 days à 1 (-2) g daily**. It has very intense **anti-inflammatory properties** but isn`t effective **intra**cellular at all. Therefore, it only works in quite early stages of the disease.

Unfortunately, it has quite a **broad spectrum of side effects** like blood cell changes,skin allergy, gastrointestinal reactions (colitis pseudomembranosa), gallstones and bilious attacks. It can **only** be given **intravenously** and is very expensive.

Treatment of chronic Lyme disease is much more complicated

Treating a chronic (late) Lyme disease patient you have to take in consideration a lot more than when treating a patient with a newly acquired infection.

Besides the antibiotic treatment one has to check the patient for any **additional burden of his immune system** like a load of heavy metal (Amalgam fillings?), any co-infections, vitamin deficiencies, mitochondropathia, deficiencies of glutathion or ATP.

Antibiotic treatment of late (chronic) LD has to be given for a minimum of 30 days

- **Azithromycin** (Zithromax®) 500 mg/day for 4 days, then 3 days off because of the **intracellular accumulation** of the drug (generally given for 6 cycles)
- **Doxycycline (Doryx®, Vibramycin®)** 2 x 200 mg/day or **Minocycline (Minocin®)** 2 x 100 mg/day (not for < 8 yrs)
- **Clarithromycin 2 x 500 mg/day** for adults (for children above 6 months adapted to their weight)
- **Plant antibiotics** like **Samento TOA-free®, Banderol®, Cumanda®, Stevia ®**(all from Nutramedix) or **Artemisin** can be given after the first antibiotic treatment with **intra-cellular effective antibiotics.**

Antibiotic treatment of late (chronic) LD has to be given for a minimum of 30 days

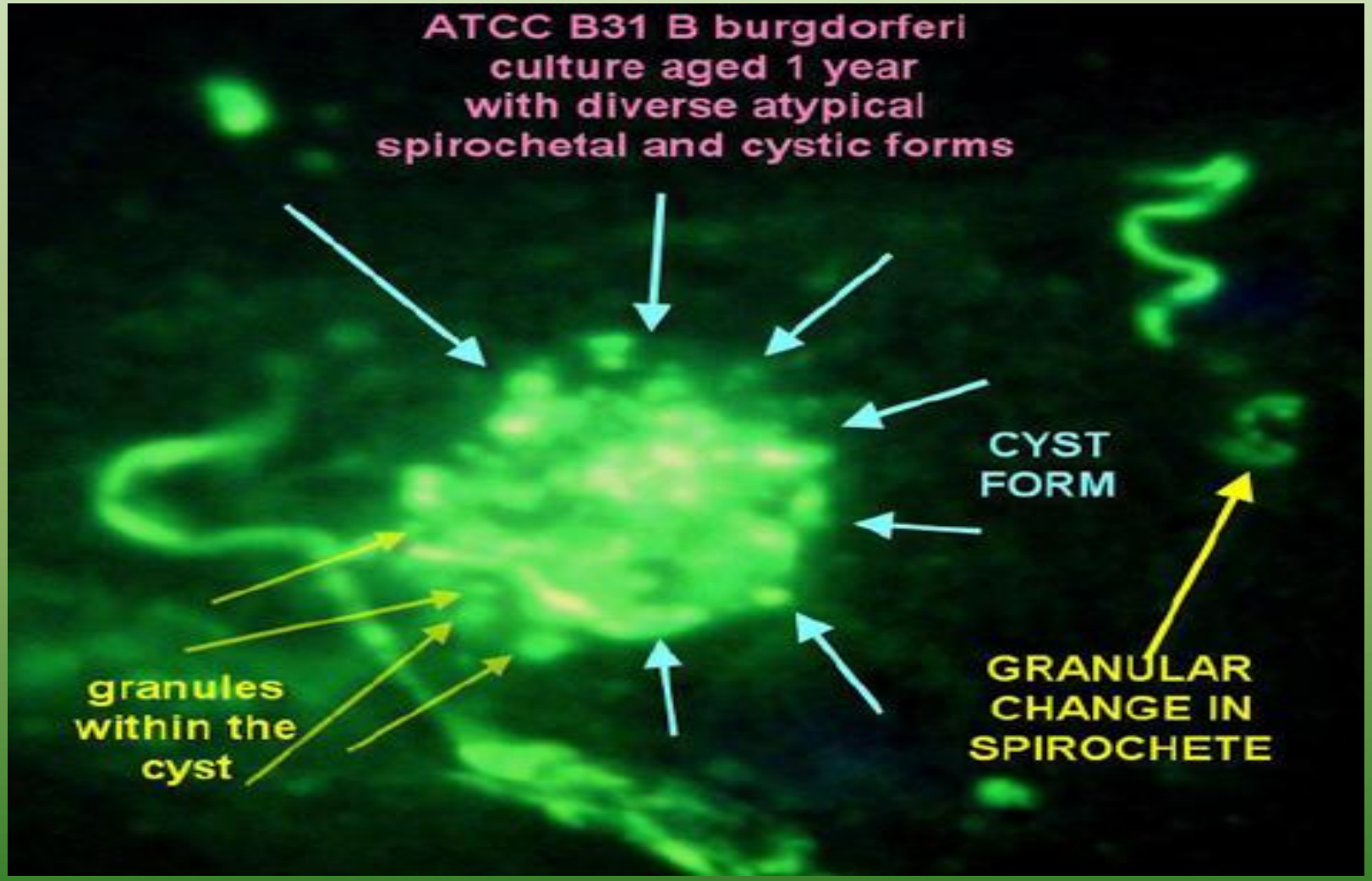
All antibiotics should always be given in **combination** with **Hydroxychloroquine** (Quensyl®, Plaquenil®) or **Tinidazol** (Fasigyn®, Tindamax®) or Metronidazol (Fema-zole®, Flagyl®) to prevent the formation of **round bodies** and **biofilms**. This combined therapy helps to reduce the number of Borrelia in the body to help to prevent further clinical relapses.

Biofilms are the most difficult forms of Borrelia to be treated, no effective treatment protocol is installed yet.

Some scientific glimpses

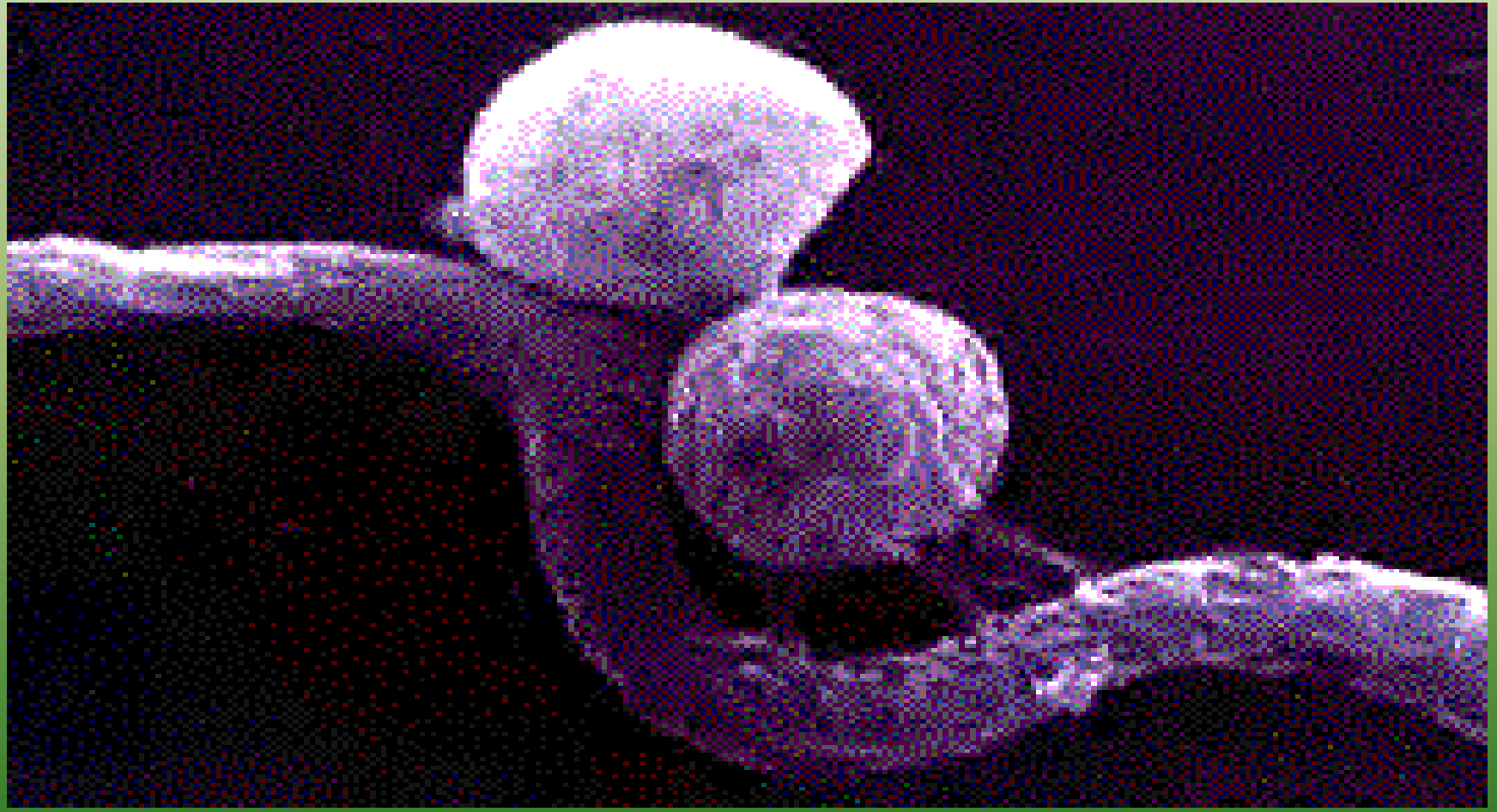
- The following fotos give you an idea how live Borrelia spirochetes look alike and how they can change their form of living. Keep in mind, that we only know some glimpses so far as new insights into their life circles are conti-nuously new detected.

The different forms and shapes of living Borrelia – all already found 1988 !!



MacDonald, Alan 1988

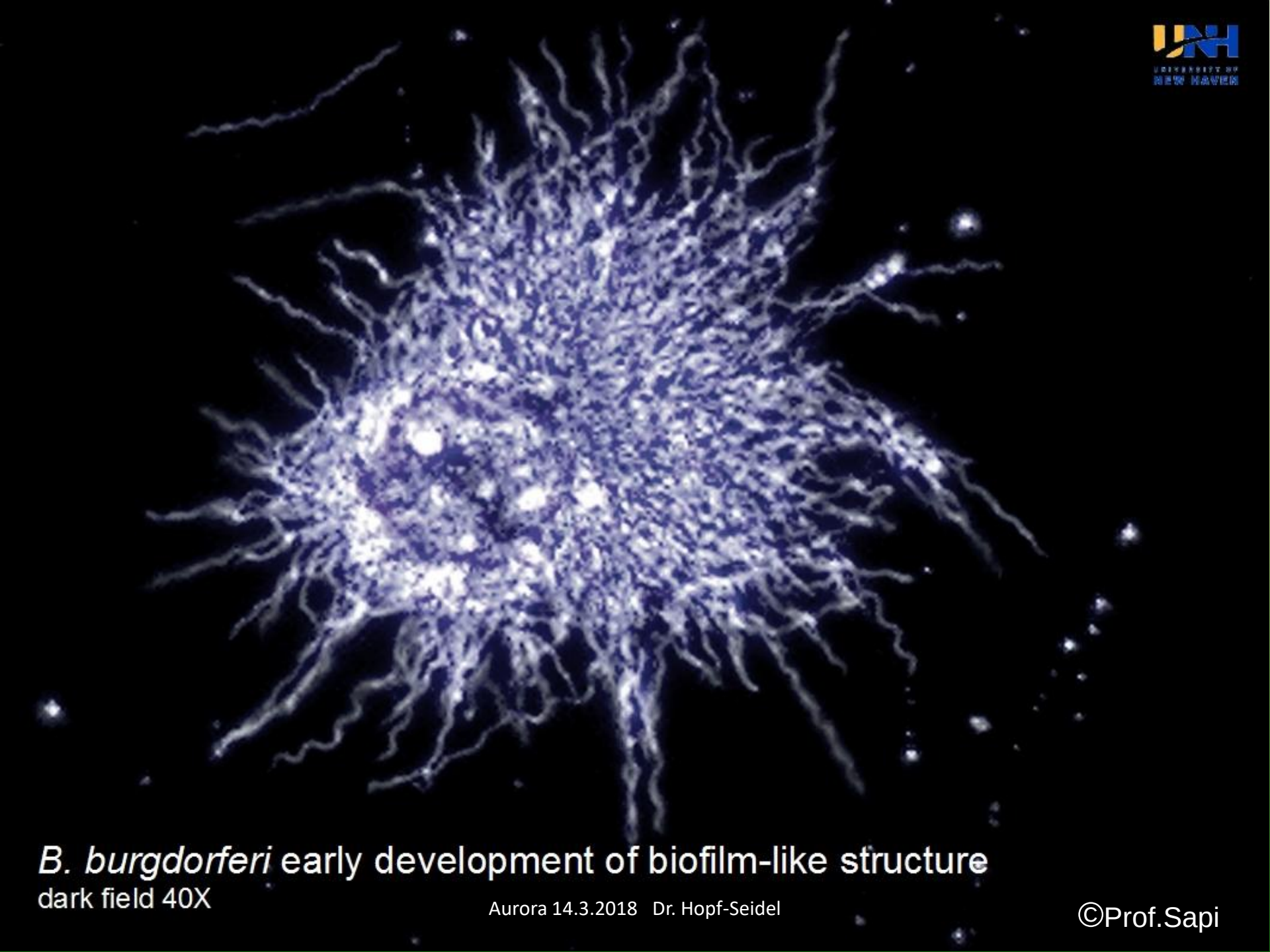
The formation of cystes of Borrelia burgdorferi in detail



Mursic et al . 1996

L-form of Borrelia

With Permission from
Dr. Alan MacDonald



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

Aurora 14.3.2018 Dr. Hopf-Seidel

Some literature about Lyme Disease **(alphabetically)**:

Ending denial.The Lyme Disease Epidemic. A **Canadian** public health disaster, edit. by Helke Ferrie, 2.ed. 2013

Hopf-Seidel, Petra, Dr.: The chronic-persistent Lyme disease 2016

Horowitz, Richard I., MD: Why can`t I get better? Solving the mystery of Lyme and chronic disease, 2013, St. Martin`s Press

Horowitz,Richard I.,MD: How can I get better? An action plan for treating resistant Lyme and chronic disease, 2017, St.Martin`s Griffin

McFadzean Nicola,N.D.: The beginner`s guide to Lyme disease. Diagnosis and treatment made simple, 2012 BioMed Publishing Group, CA

Singleton, K.B., MD: The Lyme disease solution, 2008

Weintraub, Pamela: Cure unkown - inside the Lyme epidemic, St.Martin`s Press 2009

Websites and DVD`s about Lyme disease

Canadian websites:
www.lymeontario.org
www.CanLyme.ca
www.lymeactiongroup.blogspot.ca

American websites:
www.ilads.org
www.lymeresearchalliance.org
www.lymenet.org
www.Lymedisease.org
www.lymeadvise.com

German websites:
www.dr-hopf-seidel-de with English videos, interviews and lectures
www.borreliose-bund.de
www.borreliose-nachrichten.de

DVD´s: **Under our skin**, Lyme disease documentary, part 1 and 2, ordering via www.LymeBook.com

Lyme disease - state of the art

…..“as we know, there are known knowns, there are things we know.
We also know there are known unknowns; that is to say, we know there are some things we do not know.
But there are also ***unknown unknowns, the ones that we don`t know we don`t know****”….*

Donald H. Rumsfeld
Secretary of defense
Speech on the Iracian war on Febr, 12, 2002

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

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Thank you for your attention