# Symptoms and laboratory tests in chronic Lyme disease and coinfections

## Double Tree Hotel Orlando Airport , 19th February 2016, Orlando, USA


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# The oldest patient with „Fibromyalgia“ (5300 years ago): "Iceman" Ötzi

**Ötzis enemies: Ticks!**
"**Zink’s team found almost two-thirds of the genome of *Borrelia burgdorferi*,** a bacterium that causes Lyme disease. **Zink speculates that tattoos on the iceman’s spine and ankles and behind his right knee could have been an attempt to treat the joint pain that occurs when the condition goes untreated**."



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# Chronic Lyme Borreliosis symptoms

| | |
|---|---|
| Power loss or reduction (mental/physical) at work, household, sport | >99 % |
| Fatigue/ Drowsiness/Listlessness | >99 % |
| Tingling/"Ants running"/Numbness/ „Needle burning" or „burning" skin-sensations | 81 % |
| Neck pain/ neck stiffness | 78 % |
| Shoulder pain | 76 % |
| Headache/Dizziness | 76 % |
| Changing, migrant joint pain (all joints are possible) | 68 % |
| Changing, migrant muscle pain/"Rheumatism"/General weakness of the body | 62 % |
| Feverish infection: in Stage I of Lyme disease as a sign for occurence of borrelia-bacteria in blood | ≈20 % |
| Mental strain/Depressions/Schizophrenia/Psychosis | 62 % |
| Back pain/Sciatic pain syndrome | 58 % |
| Sleeplessness with partly sweating/urge to urinate mostly between 2 and 4 o´clock at night | 47 % |
| Sore throat/Tendence for general infections/HSV or EBV-Infections | 39 % |
| „Burning eyes"/Overproduciton of tears/Blurred vision/Double vision/Lightheadedness | 28 % |

# Lyme Borreliosis: The great imitator

**20-30% of autistic disorders can be caused by Borrelia and 58% by Mycoplasma (Bransfield et al.: Med Hypotheses.2008; 70(5):967-74)**

**Multiple Sclerosis, myelopathies, polyneuropathies, brain tumor, encephalopathy.**
(Neurosurgery.1992May;30(5): 769-73)

**Can cause meningitis, encephalitis, neuritis, mania, depression, schizophrenia, anorexia, dementia.**
(Am J Psychiatry. 1994 Nov;151(11):1571-83)

**"90% of chronic fatigue patients are Lyme positive."**
(Informal study by American Lyme Disease Alliance at www.lymealliance.org)

**"Most fibromyalgia patients are Lyme positive."**
(Rheum Dis Clin North Am. 1998 May;24 (2):323-51 & report of Lida Mattman,M.D.)

"**Borrelia can cause Parkinsonism"**
(Arch.of Path.& Lab.Med.127(9):1204-6)

**Pure Lyme dementia exists and has a good outcome after antibiotics. It is advisible to do Lyme serology in demented patients.**
(Blank et al.: Journal of Alzheimer´s disease, Volume 4/2014, 1087-1093)



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# Basic diagnostic tests for chronic Lyme disease

1. **Borrelia IgM and IgG antibodies by the Microarry (SeraSpot) technique, incl. VlsE: Sensitivity around 60%, specificity around 99%**

2. **Borrelia Elispot (LTT): current Borrelia activity: Sensitivity around 84%, specificity 82-100%**

3. **CD3-/CD57+ cells: chronic Borrelia activity: Sensitivity around 70%, specificity ? (i.e. also low in Chlamydia or Mycoplasma infections)**

**All 3 tests together: >90% sensitivity+99% specificity**



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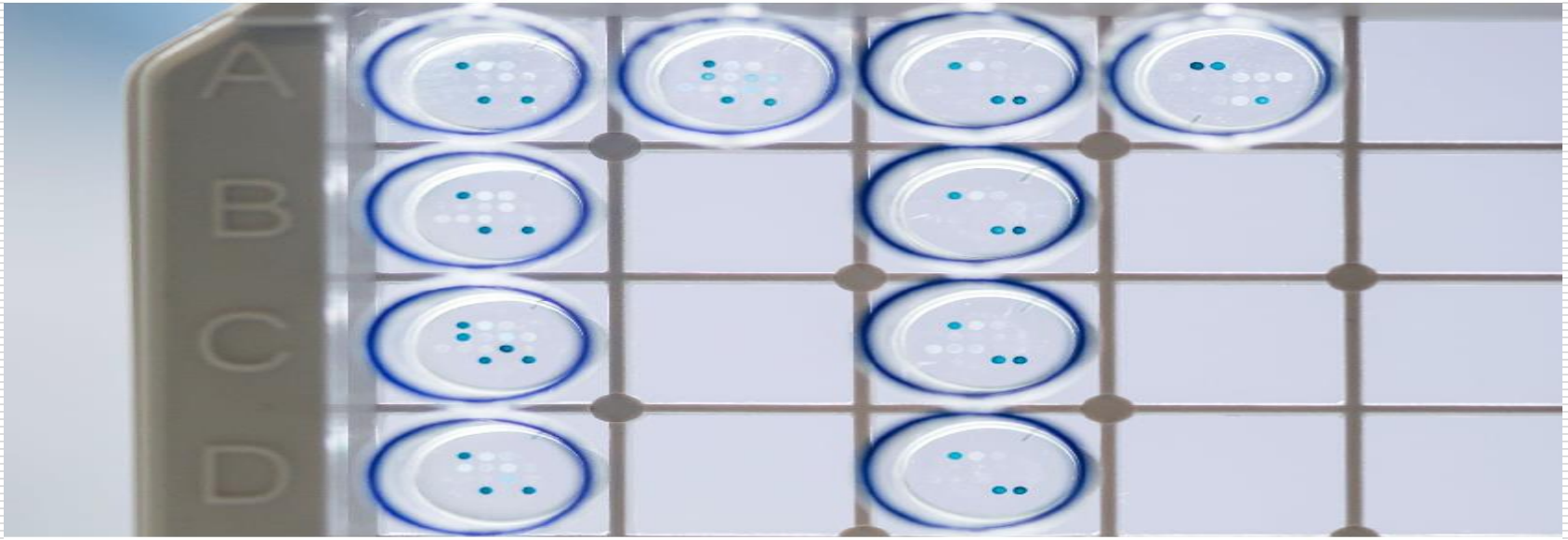
## Introducing the modern MicroArray: The SeraSpot®




Replaces the Immunoblot at ArminLabs as it

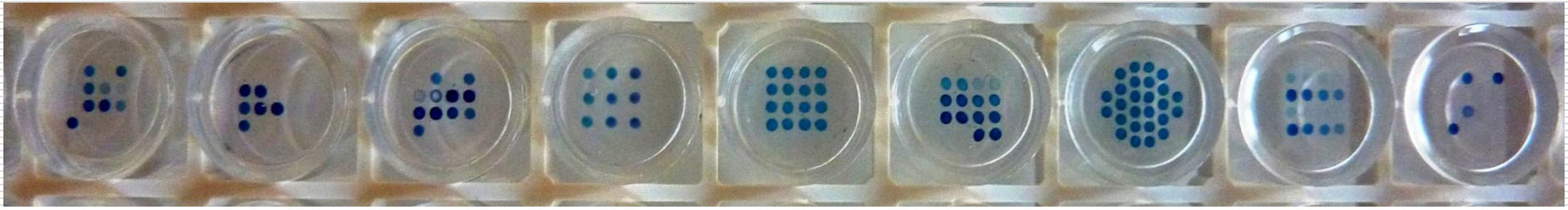
- ✓ offers a better standardisation and more controls
- ✓ combines established ELISA-technique with improved sensitivity of MicroArray analytics
- ✓ covers the following Antigens for subspecies:

VlsE(B.b. afzelii), p39(B.b. afzelii), p58(B.b. garinii), p100 (B.b. afzelii), OspC (B.b. afzelii + B.b. garinii + B.b. sensu stricto), DbpA (B.b. afzelii + B.b. garinii + B.b. sensu stricto)

# SeraSpot MicroArray

Microplates are coated with several antigen spots

…tests for 3 different European Borrelia subspecies: B.b.s.s. + B.b. garinii + B.b. afzelii (i.e., ArminLabs tests for all 3 common subspecies; IGeneX and some other labs do not)



# Reflecting the actual T-cellular activity:

## The EliSpot Established

## The established Borrelia EliSpot (T-Cell-Spot )

- ✓ reflects the actual activity of chronic and recent infections
- ✓ sensitivity is estimated at 84%, and the specificity is 94%
- ✓ is approved by the FDA in May 2011 for M. tuberculosis
- ✓ Available for: Borrelia burgdorferi, Ehrlichia, Chlamydia pneumoniae, Chlamydia trachomatis, Yersinia, EBV, CMV
- ✓ covers the following Antigens for Borrelia subspecies:

Borrelia burgdorferi Fully Antigen: Borrelia b. B31-reference strain (Borrelia b. sensu stricto)

Borrelia b. Peptide-Mix: OspA from Borrelia b. sensu stricto, Borrelia afzelii, Borrelia garinii + OspC native + DbpA recombinant

Borrelia b. LFA-1 (Lymphocyte Function Antigen 1): Own body protein + Borrelia burgdorferi sensu stricto (shared epitope)

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# ELISPOT:
# New T-Cell Test a "Game Changer" for Lyme Disease

… The sensitivity of the ELISPOT is estimated at 84%, and the specificity is 94%...

… ELISPOT assays provide robust, highly reproducible data…

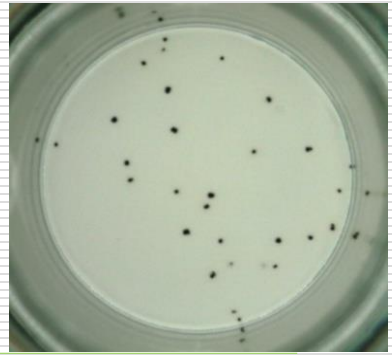
… ELISPOT can be retested to gain additional information in follow-up assays…

… the two-assay system (ELISPOT + CD57-cell count) complement each other in the quest to understand T cell-mediated immunity in vivo….

Lehman PV et al.: Unique Strengths of ELISPOT for T Cell Diagnostics in: Kalyuzhny AE. Handbook of ELISPOT: Methods and Protocols, Methods in Molecular Biology, Vol. 792. 2nd Ed: Springer; 2012: 3-23

**94 %** **Specificity of Borrelia-Elispot-LTT**

**84 %** **Sensitivity of Borrelia Elispot-LTT**





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# CD3-/CD57+ T-Lymphocytes

1. Subpopulation of the CD56+ NK cells
2. Reduction indicates **chronic activity** of Lyme disease (symptoms > 1 year)
3. Not highly specific: Also low in other bacterial infections, esp. Chlamydia pneumonia and Mycoplasma pneumoniae

**CD3-/CD57+ T-Lymphocytes**

**Reference range (mean/range)**

| | |
|---|---|
| Lyme patient: | 46 /ul / 8 – 160 /ul |
| Healthy: | 164 /ul / 60 – 354 /ul |

Source: J.J.Burrascano JR., MD, R. Stricker, MD, 2006 ILADS, Crowne Plaza Hotel, Center City Philadelphia



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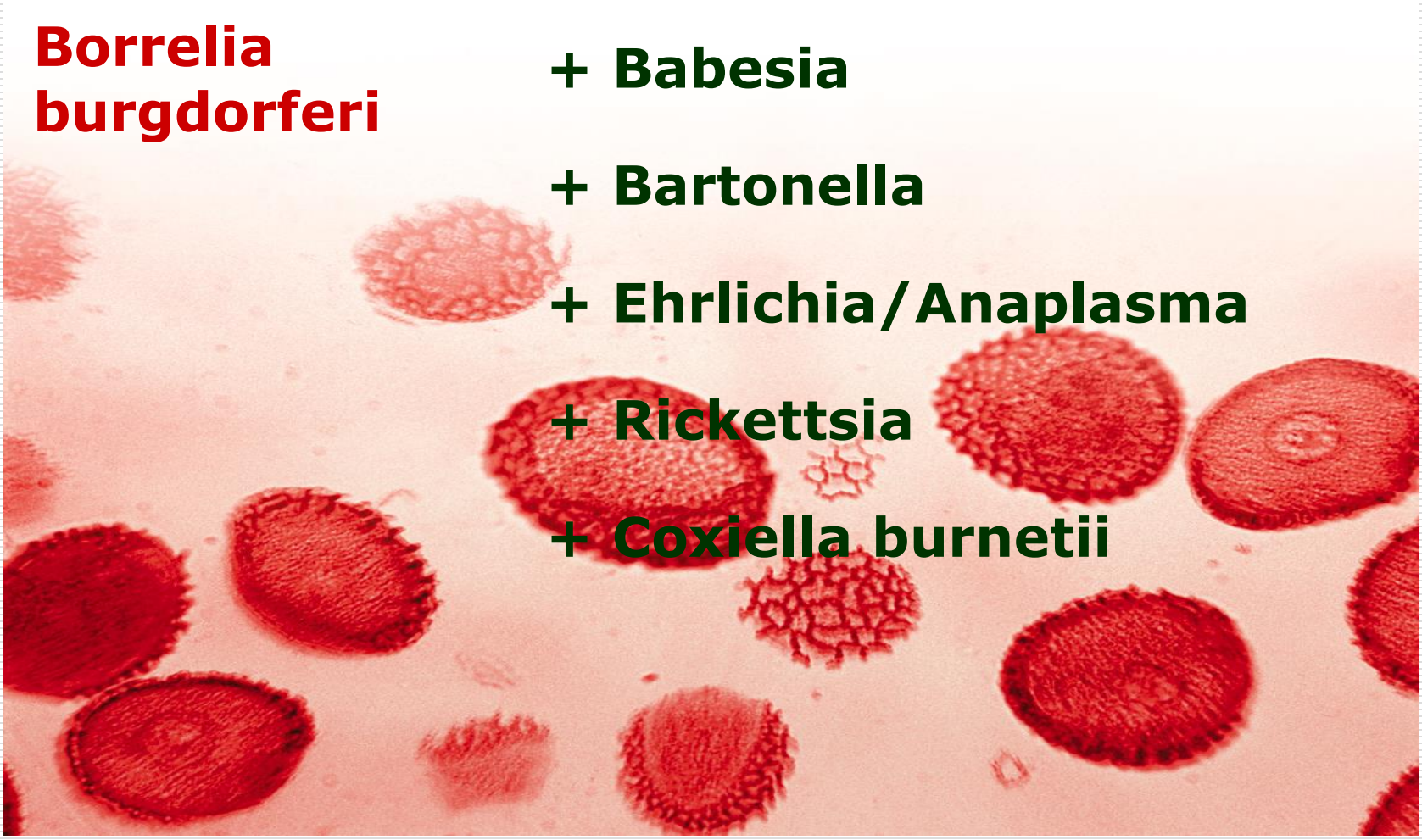
# Lyme disease + Co-infections



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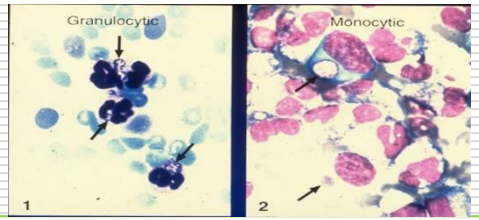
# Ehrlichia / Anaplasma



Source: CDC

Bacteria: Ehrlichia chaffeensis, Anaplasma phagocytophilum (gram-negative, obligatory intracellular in granulocytes or monocytes)

Human Granulocytic Ehrlichiosis (HGE) or

Human Monocytic Ehrlichiosis (HME)

Vector: Ixodes ricinus

Spectrum of hosts: game (e.g. deer), domestic animals, humans

Symptoms (incubation time: days up to 4 weeks): rapid onset of beginning illness with fever, headache and prostration, headaches are "sharp, knife-like and often located behind the eyes", muscle pain, not joint pain, neurological symptoms, psychiatric symptoms, rarely: diffuse vasculitic rash, including palms and soles (<10%)

Associations: Myelodysplastic syndromes, leukemia

# Bartonella

Bacteria: B. henselae (cat scratch disease), B. quintana (Trench fever, bacillary angiomatosis), B. bacilliformis (Carrion´s disease/Oroya fever), 5 other subspecies known to be pathogens for humans (gram-negative, facultative intracellular bacterium in endothelial cells/erythrocytes)

Vector/transmission: cat-scratch surface wounds, Ixodes ricinus (Germany/Europe: up to 40% of ticks are contaminated), fleas, mosquitoes, sand flies

Symptoms (incubation time 3 - 38 days): tiredness (100%), headache (80%), muscle twitches, tremors, seizures, fever in the mornings (30%, in spates of up to 6 weeks, otherwise 1 - 3 weeks), swollen lymph nodes, arthralgia (often), myalgia, insomnia, depression, agitation, severe mood swings, amentia, lack of concentration and alertness, dizziness, anxiety, outbursts, antisocial behaviour, restlessness, gastritis, intestinal symptoms, sore soles (especially in the morning), tender subcutaneous nodules along the extremities, occasional lymphadenopathy and light sweats, striae; Complications: endocarditis, retinitis, epilepsy, aseptic meningitis, hepatosplenomegaly

Associations: MGUS (Monoclonal Gammopathy of Undetermined Significance)

# Bartonella striae



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# Babesia

Bacteria: Babesia microti, Babesia divergens, Babesia duncani

Vector/transmission: Ixodes ricinus, Dermacentor reticulatus, blood transfusions

Hosts: game (e.g. deer), domestic animals, humans

Symptoms (incubation time 5 days – 9 weeks):
Rapid onset of beginning illness with severe fever, headache (can be severe/dull, global, involves the whole head, described like the head is in a vice), sweats (usually at night, but can be day-sweats as well), fatigue (worse with exercise), "air-hunger", need to sigh and take a deep breath, dry cough without apparent reason, stiffness of neck, nausea, diminished appetite, tiredness, feeling of weakness, permanent exhaustion even worse during stress, dizziness, haemolytic anaemia, hemoglobinuria, haemangiomata, (seldom) hepatosplenomegaly, muscle pain, dizziness, mental dullness and slowing of reactions and responses, hypercoagualability, stomach pain, emotional lability, "mental dullness", kidney problems, dyspnoea, influenza-like symptoms (could be lethal)

Risk factors: Splenectomy, HIV, organ transplantation, blood transfusions

# Rickettsia

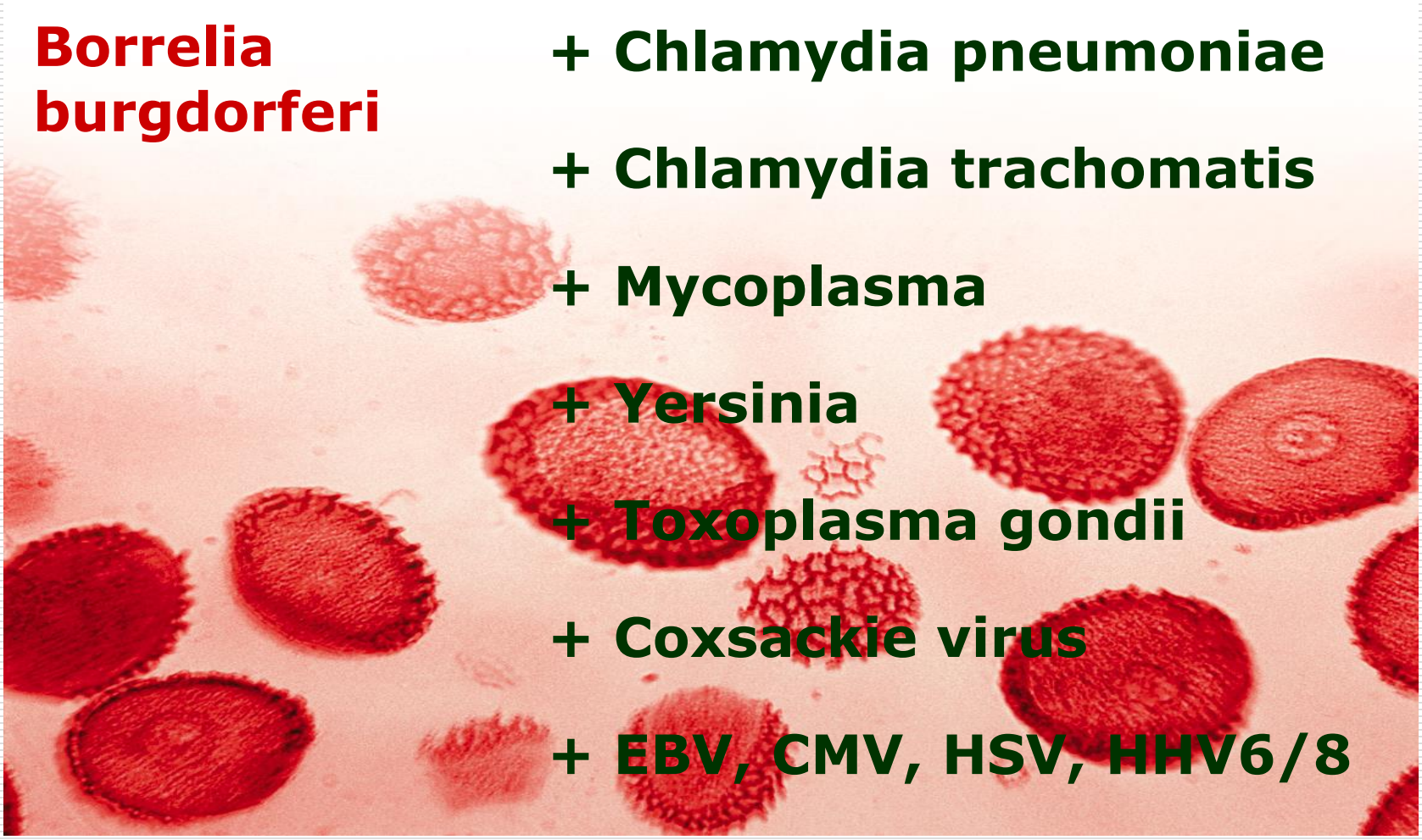
Bacteria: Rickettsia conorii (Boutonneuse Fever), R. rickettsia (RMSF), R. helvetica, R. slovaca, R. prowazekii (gram-negative, obligate intracellular in endothelial cells)

Vector/hosts: rodent, dogs, humans, Ixodes ricinus, Dermacentor reticulatus

Symptoms (incubation period 5 - 7 days): fever, nausea, vomiting, severe headache, lymphadenitis, exanthema

Complications (app. 13%): peri-/myocarditis, kidney insufficiency, pneumonia, encephalitis, gastrointestinal bleedings, anaemia, hepatitis, myalgia, meningitis

## Lyme disease + Opportunistic Infections



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# Chlamydia pneumoniae

Bacteria: Chlamydophila pneumoniae (gram-negative, intracellular); cystic and aberrant forms, biofilms

Vector/transmission: airborne infection, human to human, ticks? Or reactivated in Lyme disease (horses, koalas, frogs are infected), aerogen transmission (cough) from horses to horse-riders?

Symptoms: cough, slight throat pain, hoarseness, sinusitis, atypical pneumonia, meningoencephalitis, bronchiolitis obliterans, myocarditis, Guillain-Barre Syndrome; arthritis, tendovaginitis (4-6 weeks)

Associations: Alzheimer's, Multiple Sclerosis, depression, Fibromyalgia, ME/CFS, heart attacks, acute ischemic stroke (AIS), arteriosclerosis, autism, Parkinsonism, Rheumatoid Arthritis, etc.

# Coxsackie-Virus

Virus: Coxsackie-Virus (obligate intracellular), belongs to Picornaviridae/Enterovirus, single stranded RNA virus, divided into group A and group B

Transmission: fecal-oral contamination, droplets, body fluids, utensils, toys, diaper-changing table

Symptoms: Group A: Herpangina, AHC (acute hemorrhagic conjunctivitis, HFM (hand-foot-and-mouth disease), Group B: myocarditis, pericarditis, pleurodynia, hepatitis; Group A and B: fever, rashes, sore throat, diarrhea, cough, fatique, conjunctivitis, loss of appetite, headache, night sweats, aseptic meningitis

Complications: CNS disease similar to poliomyelitis, systemic neonatal disease, IDDM (insulin-dependent diabetes mellitus), Group A: generalized myositis with flaccid paralysis, Group B: focal muscle injury, degeneration of neuronal tissue with spastic paralysis

# MGUS (Monoclonal Gammopathy of Undetermined Significance) associated with infections

TABLE 3. **Top 20 Previously Unpublished Associations Among Olmsted County, Minnesota, Residents With MGUS, by Significance in Systematic Analysis of Diagnostic Codes**[a]

| Description | Positive MGUS cases | Case rate[b] | Positive controls | Control rate[b] | Relative risk (95% CI) | *P* value[c] |
|---|---|---|---|---|---|---|
| Hyperlipidemia[d] | 247 | 2205.1 | 8653 | 3321.7 | 0.7 (0.6-0.8) | <.001 |
| Uterus retroversion | 6 | 347.9 | 36 | 32.6 | 10.7 (4.5-25.4) | <.001 |
| Chalazion | 44 | 336.9 | 695 | 170.7 | 1.97 (1.5-2.7) | <.001 |
| Clavicle fracture | 4 | 27.8 | 7 | 1.7 | 15.9 (4.6-55.9) | <.001 |
| Upper respiratory bacterial infection | 4 | 30.4 | 11 | 2.4 | 12.6 (3.9-40.5) | <.001 |
| Small intestine diverticulum | 4 | 32.6 | 5 | 1.8 | 18.0 (4.7-68.6) | <.001 |
| Acute depression | 13 | 183.2 | 172 | 54.4 | 3.4 (1.9-5.9) | <.001 |
| Vitreous degeneration | 6 | 47.2 | 31 | 7.3 | 6.5 (2.7-15.7) | <.001 |
| Aphakic detachment | 3 | 22.9 | 3 | 0.8 | 29.5 (5.8-150.4) | <.001 |
| Vertebral fracture | 26 | 301.8 | 217 | 130.8 | 2.3 (1.5-3.5) | <.001 |
| Ventricle hypertrophy due to hypertension | 9 | 69.8 | 54 | 17.7 | 3.9 (1.9-8.0) | <.001 |
| Spontaneous bacterial peritonitis | 3 | 20.8 | 5 | 1.3 | 16.7 (3.9-72.3) | <.001 |
| Peritoneum cyst | 4 | 28.3 | 14 | 3.2 | 8.8 (2.8-27.2) | <.001 |
| Group I hypertension | 16 | 119.4 | 188 | 44.5 | 2.7 (1.6-4.5) | <.001 |
| Sural phlebitis | 4 | 29.3 | 13 | 3.3 | 8.8 (2.8-27.3) | <.001 |
| Mycobacterium infection | 4 | 29.3 | 11 | 3.2 | 9.1 (2.8-29.0) | <.001 |
| Hypercholesterolemia | 68 | 501.2 | 2835 | 782.4 | 0.6 (0.5-0.8) | <.001 |
| Sigmoid diverticulum with diverticulitis | 10 | 71.1 | 80 | 21.5 | 3.3 (1.7-6.4) | <.001 |
| Hyperglycemia | 48 | 386.9 | 1871 | 647.7 | 0.6 (0.5-0.8) | <.001 |
| Subconjunctival hematoma | 3 | 21.6 | 8 | 1.9 | 11.2 (2.9-43.0) | <.001 |

[a] CI = confidence interval; MGUS = monoclonal gammopathy of undetermined significance.
[b] Rates per 100,000 person-years; age and sex adjusted.
[c] Unadjusted *P* values are reported.
[d] *P* value was significant after Bonferroni correction for 16,062 comparisons.

Mod. nach Bida JP et al., Mayo Clin Proc 2009; 84: 685-693

# MGUS in Lyme disease and Bartonella infections

- Borrelia burgdorferi (B. afzelii) und Erythema migrans
  Böer A et al., Br J Dermatol 2007; 156: 1263-1273; Aberer E et al., Lancet 2011; 377: 178
- Bartonella henselae und quintana
  Krause R et al., Am Haematol 2003; 82: 455-457;
  Seve P et al., Am J Haematol 2006; 81: 115-117

# MGUS: Laboratory tests

1. Borrelia-EliSpot + Borrelia-SeraSpot + CD57-cells
2. Bartonella-IgG/IgM-antibodies

# Myelodysplastic syndromes / Leukemia

Myelodysplastic diseases and Ehrlichia: Consideration of a possible etiologic connection and mechanisms of pathogenesis, in 12th annual symposium on myelodysplastic syndromes (Abstract #238), Berlin, 2013

Could ehrlichial infection cause some of the changes associated with leukemia, myelodysplastic diseases and autoimmune disorders, and offer antibiotic treatment options?, Kallick, C.A.; Friedman, D.A., Nyindo, M.; Medical hypotheses (2015) 891-893, Elsevier Ltd.: "…We reference here 3 leukemia patients with direct or indirect evidence of Ehrlichia/Anaplasma (EA) infection….Though they did not survive, their condition improved dramatically for a time, suggesting Rifampin provided some therapeutic benefit…"

# Myelodysplastic syndrome/Leukemia: Laboratory tests

1. Ehrlichia/Anaplasma IgG/IgM antibodies
2. Ehrlichia/Anaplasma EliSpot

# B-Cell Non Hodgkin Lymphoma: EBV / CMV

- **Epstein Barr Virus-associated Non-Hodgkin's lymphoma of B-cell origin, Hodgkin's disease, acute leukemia, and systemic lupus erythematosus: a serologic and molecular analysis, Mitarnun W, Pradutkanchana J, Takao S, Saechan V, Suwiwat S, Ishida T http://www.ncbi.nlm.nih.gov/pubmed/12188384**
- **EBV-Associated Lymphoproliferative Disorders: Classification and Treatment, Carbone A, Annunziata G, Dotti, G, The oncologist** 1083-7159/2008
- **Cytomegalovirus infection in patients with lymphoma: an important cause of morbidity and mortality. Torres HA, Kontoyiannis DP, Aguilera EA, Younes A, Luna MA, Tarrand JJ, Nogueras GM, Raad II, Chemaly RF. Clin. Lymphoma Myeloma, 2006 Mar;6(5): 393-8**

# B-Cell Non Hodgkin Lymphoma: Coxiella burnetii

- **B-Cell Non-Hodgkon Lymphoma linked to Coxiella burnetii. Melenotte C. et al. www.bloodjournal.org Blood First Edition Paper November 12, 2015:**

  **„Coxiella burnetii is associated with an increased risk of lymphoma, its presence in the tumor microenvironment may favor lymphomagenesis."**

  **„Lymphoma has to be consdered in patients with Q fever and lymphoid disorders, especially those with persistent focalized infections."**

# B-Cell Non Hodgkin Lymphoma: Coxiella burnetii

**Q fever** is a worldwide disease with acute and chronic stages caused by the bacteria ***Coxiella burnetii***.

Cattle, sheep, and goats are the primary reservoirs. Coxiella burnetii are excreted in milk, urine, and feces of infected animals. During birthing Coxiella burnetii are shed in high numbers within the amniotic fluids and the placenta. The organism is extremely hardy and resistant to heat, drying.

Infection of humans usually occurs by inhalation of Coxiella burnetii from air that contains airborne barnyard dust contaminated by dried placental material, birth fluids, and excreta of infected animals. Other modes of transmission to humans, **including tick bites**, ingestion of unpasteurized milk or dairy products.

# B-cell Non Hodgkin Lymphoma: Laboratory tests

1. EBV-antibodies
2. EBV-EliSpot
3. CMV-antibodies
4. CMV-EliSpot
5. Coxiella burnetii IgG/IgM antibodies
6. Ehrlichia/Anplasma IgG/IgM antibodies
7. Ehrlichia/Anplasma EliSpot
8. Borrelia-EliSpot
9. CD57 cells + Borrelia-SeraSpot + CD57 cells

# Multiple symptoms = Multiple infections



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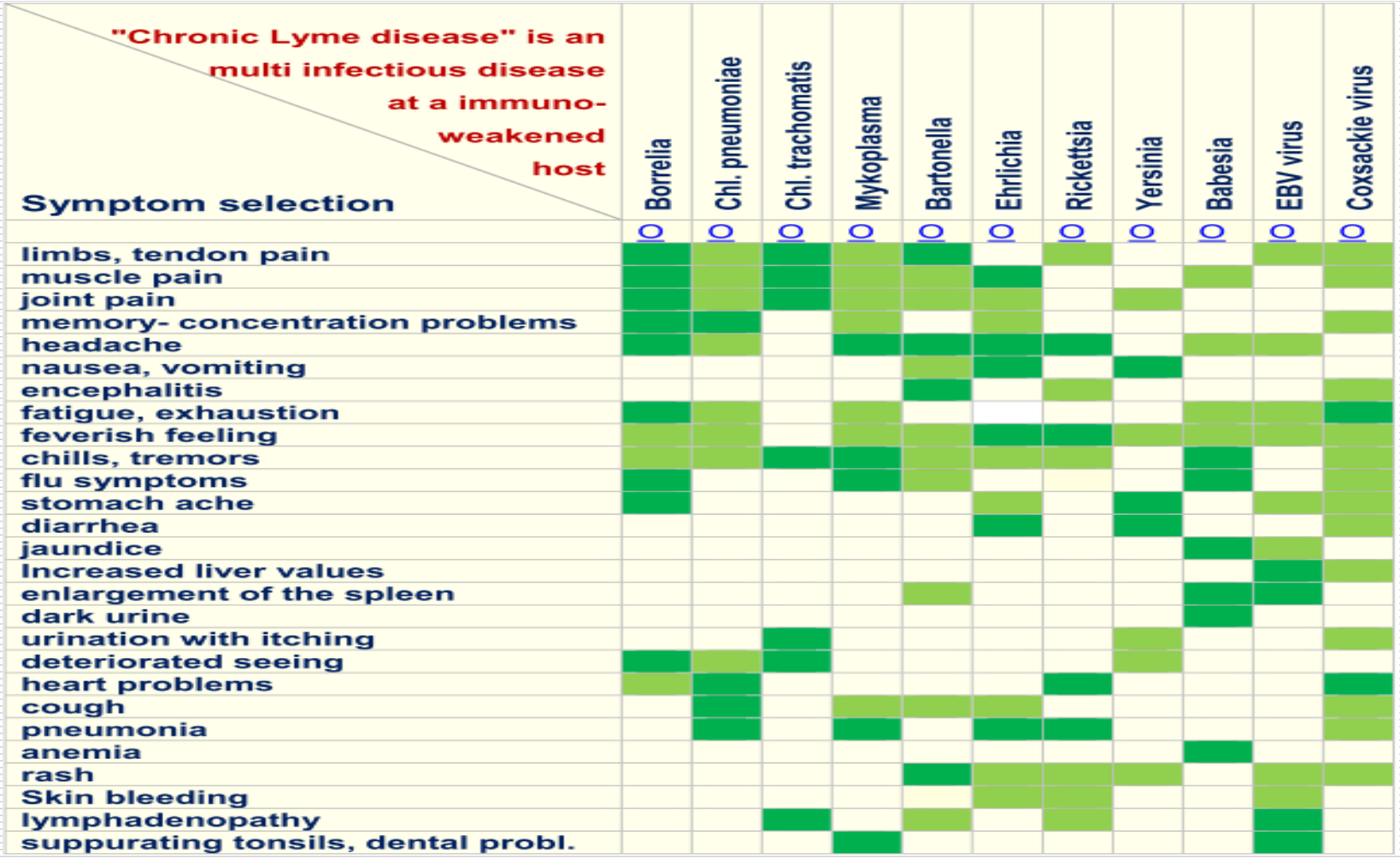
# MULTIPLE SYMPTOMS = MULTIPLE INFECTIONS



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# The coinfections checklist for patients, developed by Dr. Schwarzbach

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86154 Augsburg
GERMANY

## Coinfections-Checklist

Name, first name ..... Date (DD/MM/YYYY) .....

| | Actual and former symptoms<br>Please mark with a cross | X | Score-Points<br>(filled in by physician/naturopath) | Ranking |
|---|---|---|---|---|
| 1 | Stomach ache, gut problems | | Ehrlichia: ..... | |
| 2 | Anaemia | | Babesia: ..... | |
| 3 | Diarhoea intermittent | | Rickettsia: ..... | |
| 4 | Fever or feverish feeling | | Bartonella: ..... | |
| 5 | Lack of concentration, memory disturbance, forgetfulness | | Chl.pneumoniae: ..... | |
| 6 | Encephalitis/Inflammation of the brain (NMR) | | Chl.trachomatis: ..... | |
| 7 | Yellowish colour of the skin/eyes | | Yersinia: ..... | |
| 8 | Painful joints, swollen joints | | Mykoplasma: ..... | |
| 9 | General aches and pains, tendon problems | | Coxsackie-Virus: ..... | |
| 10 | Flu-like symptoms intermittent | | EBV/CMV: ..... | |
| 11 | Rash(es) | | | |
| 12 | Small red/purple spots of the skin | | | |
| 13 | Heart problems, disturbance of cardiac rhythm | | | |
| 14 | Cough, expectoration | | | |
| 15 | Headache | | | |
| 16 | Impaired liver function/ liver laboratory values | | | |
| 17 | Pneumonia, bronchitis | | | |
| 18 | Swollen lymph nodes | | | |
| 19 | Tonsilitis | | | |
| 20 | Enlargement of the spleen | | | |
| 21 | Fatigue / exhaustion, intermittent or chronic CFS | | | |
| 22 | Muscle pain, muscle weakness | | | |
| 23 | Shivering, chill | | | |
| 24 | Blurred, foggy, cloudy, flickering, double vision | | | |
| 25 | Nausea, vomiting | | | |
| 26 | Dark urine | | | |
| 27 | Itching or pain when urinating | | | |


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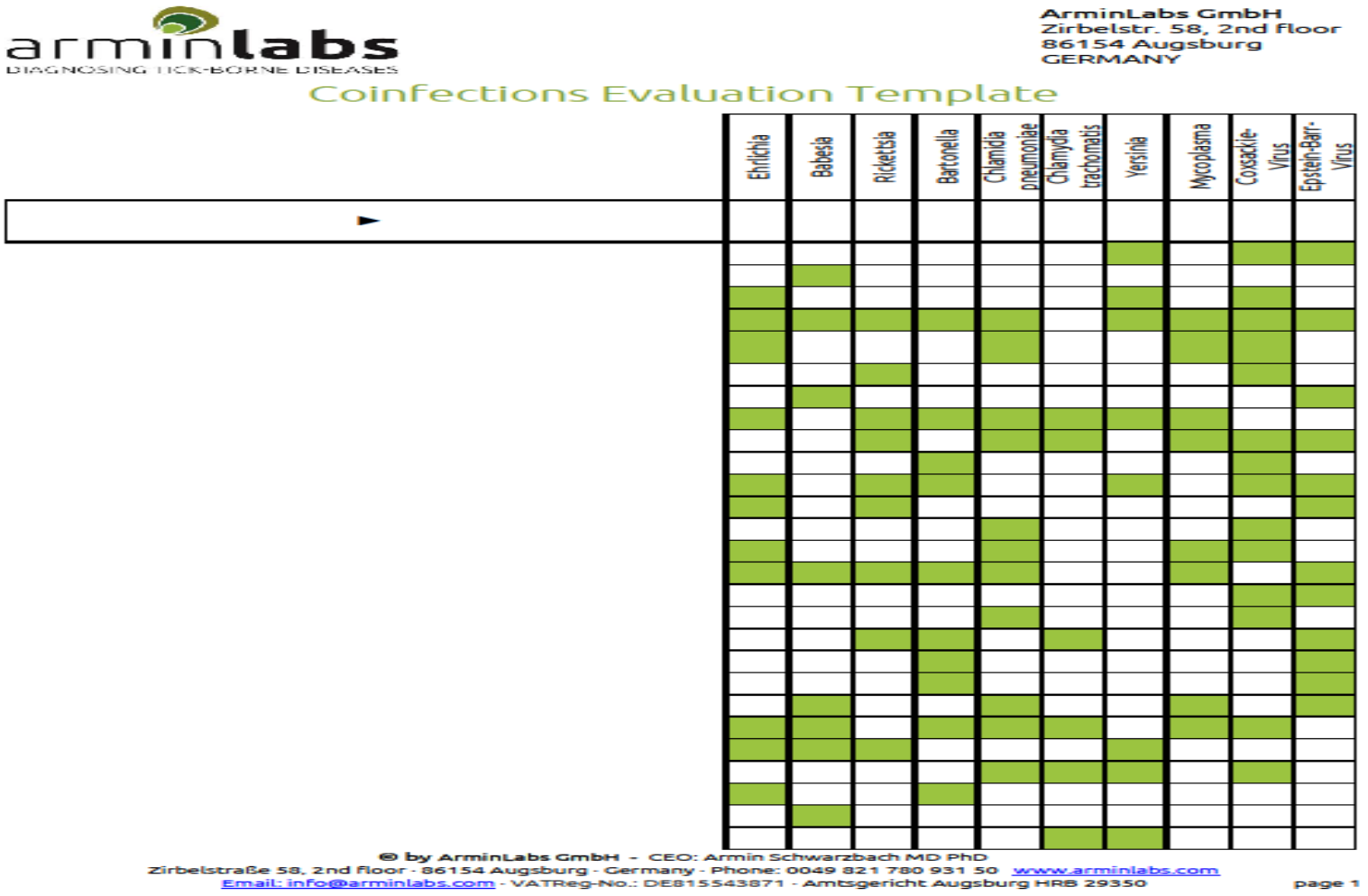
# Evaluation template for doctors/naturopaths, developed by Dr. Schwarzbach



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# Coinfections checklist: Patient 1

**B.C.**
Name, First name

**15th Oct. 2010**
Date

| ► | **Symptoms - Please tick the appropriate symptoms** (to be filled in by the patient) | X | **Score-Points** (to be filled in by the physician) | **Ranking** |
|---|---|---|---|---|
| 01 | Stomach-ache | X | Ehrlichia: **5** | **4** |
| 02 | Anaemia | | Babesia: **5** | **4** |
| 03 | Diarhoea | | Rickettsia: **5** | **4** |
| 04 | Fever or feverish feeling | X | Bartonella: **6** | **3** |
| 05 | Lack of concentration, memory disturbance, forgetfulness | X | Chl.pneumoniae: **8** | **1** |
| 06 | Encephalitis (Inflammation of the brain) | | Chl.trachomatis: **3** | **6** |
| 07 | Yellowish colour of the skin (Jaundice) | X | Yersinia: **4** | **5** |
| 08 | Painful joints | X | Mykoplasma: **7** | **2** |
| 09 | General aches and pains | X | Coxsackie-Virus: **7** | **2** |
| 10 | Flu-like symptoms | X | EBV: **6** | **3** |
| 11 | Rash | | | |
| 12 | Petechiae | | | |
| 13 | Heart-problems | X | | |
| 14 | Cough | | | |
| 15 | Headache | X | | |
| 16 | Impaired liver function/ liver parameters | | | |
| 17 | Pneumonia | | | |
| 18 | Swollen or inflamed lymph nodes | | | |
| 19 | Tonsilitis | | | |
| 20 | Enlargement of the spleen (Splenomegaly) | | | |
| 21 | Fatigue / exhaustion | X | | |
| 22 | Muscle pain | X | | |
| 23 | Shivering | X | | |
| 24 | Blurred vision | | | |
| 25 | Nausea, vomiting | X | | |
| 26 | Dark urine | X | | |
| 27 | Painful or ichty urinating | | | |



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# Laboratory test results: Patient 1 – Page 1

| | | Results | Unit | Reference range |
|---|---|---|---|---|
| **Borrelia burgdorferi antibodies (ELISA)** | | | | |
| Borrelia IgG antibodies (ELISA) | **+** | **71.9** | RU/ml | < 16=neg. >22.0=pos. |
| Borrelia IgM antibodies (ELISA) | | 4.72 | RU/ml | < 16=neg. >22.0=pos. |
| **Borrelia burgdorferi antibodies (immunoblot)** | | | | |
| Borrelia Blot IgG antibodies | **+** | **positive** | | negative |
| | | **Bands: OspC (+),p41 +, VlsE-Bb +** | | |
| Borrelia Blot IgM antibodies | | negative | | negative |
| **Borrelia burgdorferi EliSpot** | | | | |
| Borrelia burgd. full antigen | **+** | **4** | SI | < 2 |
| Borrelia OSP mix (OSPA/OSPC/DbpA) | **+** | **3** | SI | < 2 |
| Borrelia LFA-1 | | 1 | SI | < 2 |
| **Yersinia antibodies** | | | | |
| Yersinia IgG antibodies (EIA) | **+** | **1.9** | ratio | < 0.8=neg.; >1.1=pos. |
| Yersinia IgA antibodies (EIA) | **+** | **8.6** | ratio | < 0.8=neg.; >1.1=pos. |

# Laboratory test results: Patient 1 – Page 2

| | | Results | Unit | Reference range |
|---|---|---|---|---|
| **Yersinia EliSpot** | | | | |
| Yersinia EliSpot | + | **20** | SI | < 2 |
| **Chlamydia pneumoniae antibodies** | | | | |
| Chlam.pneum. IgG antibodies (ELISA) | + | **1.2** | ratio | < 0.8=neg.; >1.1=pos. |
| Chlam.pneum. IgA antibodies (ELISA) | + | **3.5** | ratio | < 0.8=neg.; >1.1=pos. |
| **Chlamydia pneumoniae EliSpot** | | | | |
| Chlamydia pneumoniae EliSpot | + | **18** | SI | < 2 |
| **Mycoplasma pneumoniae antibodies** | | | | |
| Mycoplasma pneumoniae IgG (EIA) | + | **1.1** | ratio | < 0.8=neg.; >1.1=pos. |
| Mycoplasma pneumoniae IgM (EIA) | | 0.3 | ratio | < 0.8=neg.; >1.1=pos. |
| Mycoplasma pneumoniae IgA (EIA) | + | **2.0** | ratio | < 0.8=neg.; >1.1=pos. |
| **Cytomegalovirus** | | | | |
| Cytomegalovirus IgG antibodies (EIA) | + | **3.7** | ratio | < 0.8=neg.; >1.1=pos. |
| Cytomegalovirus IgM antibodies (EIA) | | 0.3 | ratio | < 0.8=neg.; >1.1=pos. |
| **Cytomegalovirus EliSpot** | | | | |
| CMV EliSpot | + | **4** | SI | <2 |

# Laboratory test results: Patient 1 – Page 3

| | | Results | Unit | Reference range |
|---|---|---|---|---|
| **Coxsackie-Virus antibodies** | | | | |
| Coxsackie Virus IgG Type B1 (IFT) | + | **1:400** | titer | < 1:100 |
| Coxsackie Virus IgA Type B1 (IFT) | + | **1:100** | titer | < 1:10 |
| | | | | |
| **Rickettsia antibodies** | | | | |
| Rickettsia rickettsii IgG antibodies | + | **1:256** | titer | < 1:64 |
| Rickettsia typhi IgG antibodies | | < 1:64 | titer | < 1:64 |
| | | | | |
| **Epstein-Barr-Virus antibodies** | | | | |
| EBV-CA IgG antibodies (EIA) | + | **7.1** | ratio | < 0.8=neg; >1.1=pos |
| EBV-EBNA antibodies (EIA) | + | **4.2** | ratio | < 0.8=neg; >1.1=pos |
| EBV-CA IgM antibodies (EIA) | | 0.4 | ratio | < 0.8=neg; >1.1=pos |
| | | | | |
| **Epstein-Barr Virus EliSpot** | | | | |
| EBV-EliSpot (lytic) | + | **17** | SI | < 2 |
| EBV-EliSpot (latent) | + | **8** | SI | < 2 |
| | | | | |
| **CD 57 flow cytometry** | | | | |
| CD 57 positive NK cells | - | **37** | /µl | 100-360 |

# Summary Patient 1

**Coinfections checklist (symptoms):**

Multiple infection with

Borrelia burgdorferi + Chlamydia pneumoniae + Mycoplasma pneumoniae + Coxsackie virus +

Epstein Barr Virus + Rickettsia + Yersinia

**Laboratory test results:**

Multiple infections with

Borrelia burgdorferi + Chlamydia pneumoniae + Mycoplasma pneumoniae + Coxsackie-Virus + Epstein Barr Virus + Rickettsia rickettsii + Yersinia + Cytomegalovirus

# Therapeutic options: antibiotics

**Antibiotics for Borrelia + Chlamydia + Mycoplasma:**

- Macrolides (Azithromycin, Clarythromycin)
- Doxycycline/Minocycline
- Metronidazole/Tinidazole
- Cefalosporines (Ceftriaxone, Cefuroxim, Cefotaxim)

**Remedies that have an intracellular action:**

- Hydroxychloroquin (Plaquenil)
- Artemisinin (Nobel Prize Winner 2015!)

# Therapy options: Immune system + Biofilms

**Immune system**

- Immunmodulation (vitamins, minerals, probiotics, chelation, detoxification etc.)
- Herbal products / Alternative pathways

**Biofilms "breakers"**

- Serrapeptase
- Lumbrokinase
- Nattokinase

**Important: LDN !**

# Thank you very much for your attention !

arminlabs
DIAGNOSING TICK-BORNE DISEASES

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