
Symptoms and laboratory tests in chronic Lyme disease and coinfections

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



Ötzi's 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."

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 occurrence 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"/Overproduction 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 advisable to do Lyme serology in demented patients.

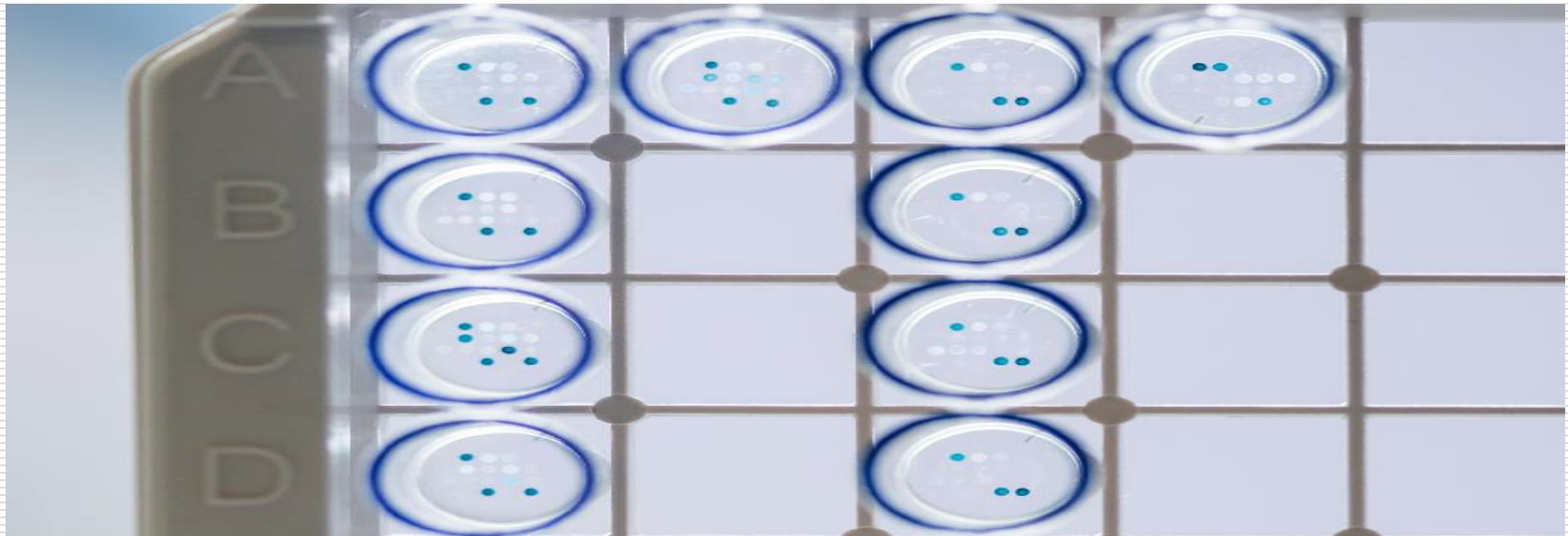
(Blank et al.: Journal of Alzheimer's disease, Volume 4/2014, 1087-1093)

Basic diagnostic tests for chronic Lyme disease

1. **Borrelia IgM and IgG antibodies** by the Microarray (**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

Introducing the modern MicroArray: **The SeraSpot®**



Replaces the Immunoblot at ArminLabs as it

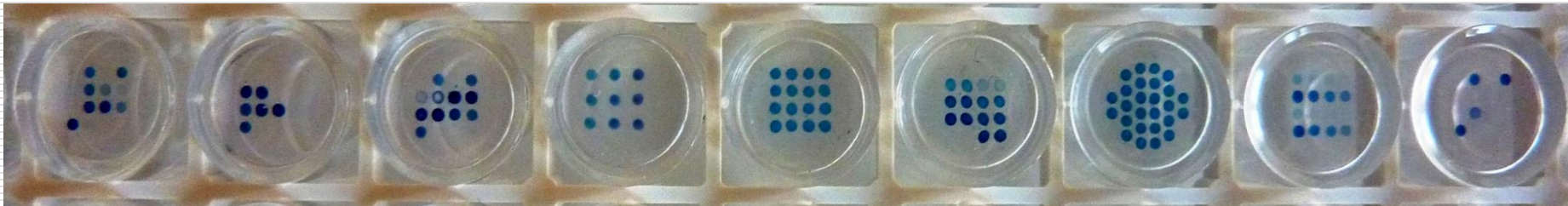
- ✓ offers a better standardisation and more controls
- ✓ combines established ELISA-technique with improved sensitivity of MicroArray analytics
- ✓ covers the following Antigens for subspecies:

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 Antigenes 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)


arminlabs
DIAGNOSING TICK-BORNE DISEASES

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



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

Lyme disease

+ Co-infections

**Borrelia
burgdorferi**

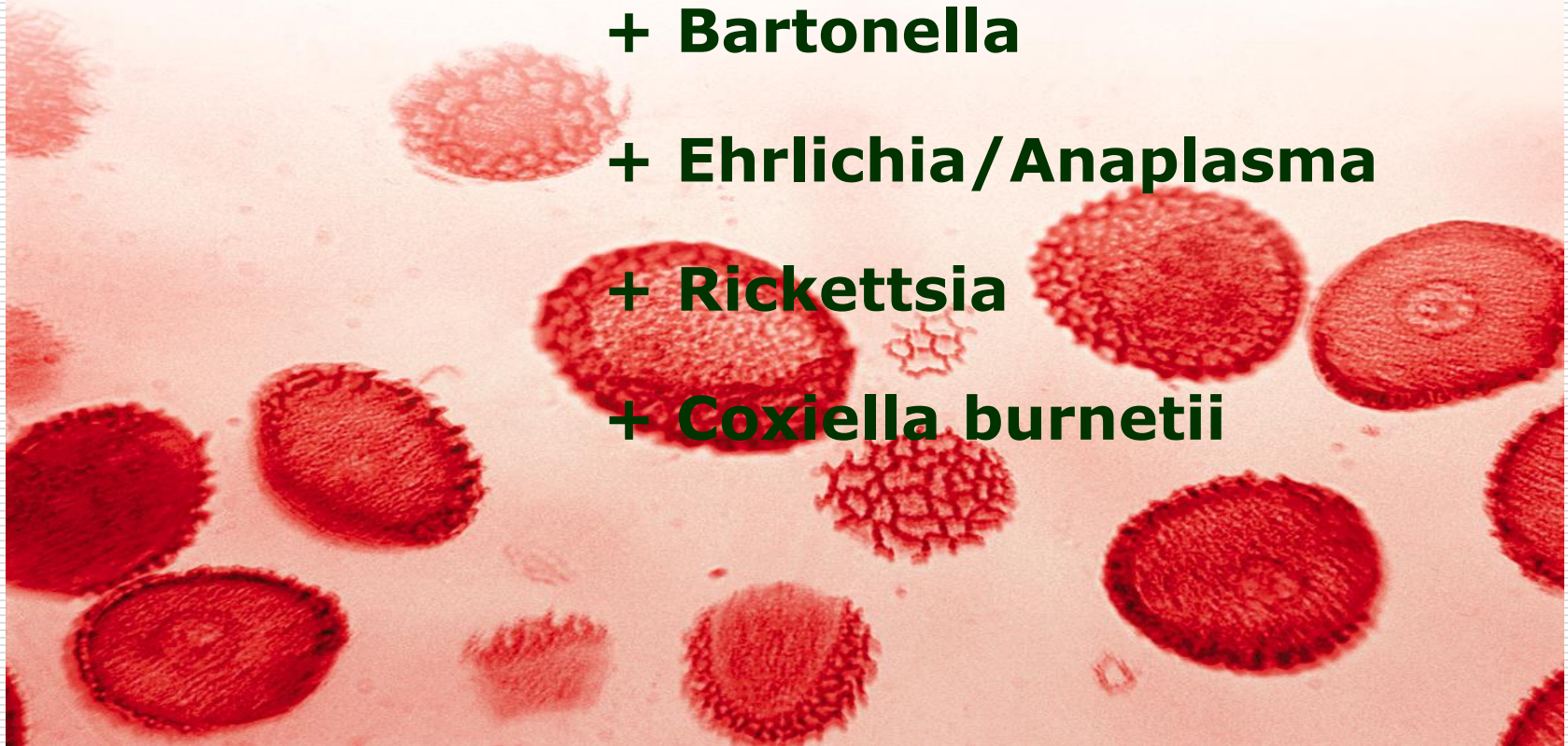
+ Babesia

+ Bartonella

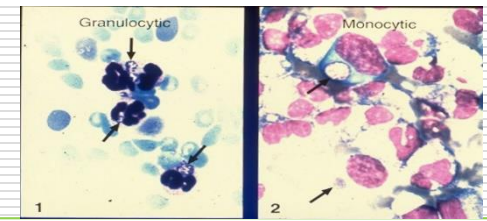
+ Ehrlichia/Anaplasma

+ Rickettsia

+ Coxiella burnetii



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, amnesia, 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



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, hypercoagulability, 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

**Borrelia
burgdorferi**

+ Chlamydia pneumoniae

+ Chlamydia trachomatis

+ Mycoplasma

+ Yersinia

+ Toxoplasma gondii

+ Coxsackie virus

+ EBV, CMV, HSV, HHV6/8

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, fatigue, 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-Hodgkin 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 considered 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



MULTIPLE SYMPTOMS = MULTIPLE INFECTIONS

Symptom selection	"Chronic Lyme disease" is an multi infectious disease at a immuno- weakened host										
	Borrelia	Chl. pneumoniae	Chl. trachomatis	Mykoplasma	Bartonella	Ehrlichia	Rickettsia	Yersinia	Babesia	EBV virus	Coxsackie virus
limbs, tendon pain	○	○	○	○	○	○	○	○	○	○	○
muscle pain											
joint pain											
memory- concentration problems											
headache											
nausea, vomiting											
encephalitis											
fatigue, exhaustion											
feverish feeling											
chills, tremors											
flu symptoms											
stomach ache											
diarrhea											
jaundice											
Increased liver values											
enlargement of the spleen											
dark urine											
urination with itching											
deteriorated seeing											
heart problems											
cough											
pneumonia											
anemia											
rash											
Skin bleeding											
lymphadenopathy											
suppurating tonsils, dental probl.											

The coinfections checklist for patients, developed by Dr. Schwarzbach

Coinfections-Checklist

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

	Actual and former symptoms Please mark with a cross	X	Score-Points (filled in by physician/naturopath)	Ranking
1	Stomach ache, gut problems		Ehrlichia:	
2	Anaemia		Babesia:	
3	Diarrhoea 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			

Coinfections Evaluation Template

[illegible]

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)	Ran-king
01	Stomach-ache	X	Ehrlichia: 5	4
02	Anaemia		Babesia: 5	4
03	Diarrhoea		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	Tonsillitis			
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			

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
- ☐ Cephalosporines (Ceftriaxone, Cefuroxim, Cefotaxim)

Remedies that have an intracellular action:

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

Therapy options: Immune system + Biofilms

Immune system

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

Biofilms “breakers”

- Serrapeptase
- Lumbrokinase
- Nattokinase

Important: LDN !

Thank you very much for your attention !



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