



The challenge of developing staging processes in laboratory diagnosis of Lyme and co-infections

ILADS Conference Washington D.C., 25th Oct. 2009

Armin Schwarzbach M.D. Ph.D.

Specialist for laboratory medicine
Member of German Lyme Society
(Deutsche Borreliose-Gesellschaft e.v.)
Member of International Lyme and
Associated Diseases Society (ILADS) USA
Member of California Lyme
Disease Association (CALDA) USA

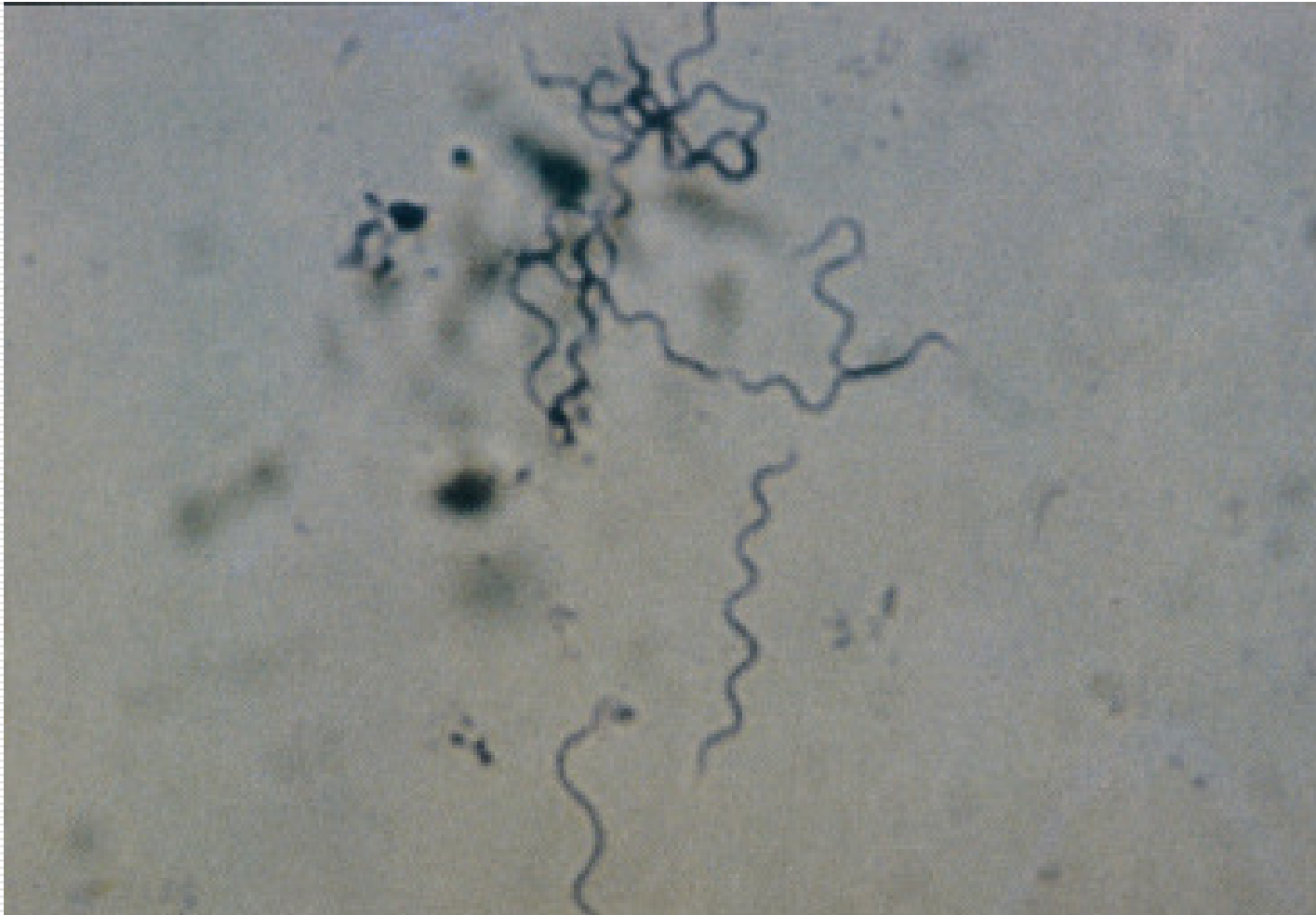
Borreliose Centrum Augsburg

Center for tick-borne diseases and co-infections

Tel. +49 (821) 455471-0

www.b-c-a.de

Borrelia burgdorferi



Contamination of Borrelia infected ticks

Contamination of ticks with Borrelia

- **Germany** **30 - 50 % !**
(e.g. parks in the city of Hamburg or Munic:
50% !)
- **Switzerland** **5-34 %**
- **Austria** **2-26 %**
- **Sweden** **13-29 %**
- **Slovenia** **23 %**
- **Russia** **30 %**

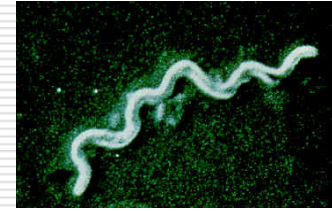
Contamination of ticks in Switzerland: Current data

- ❑ **25 % free of pathogens**
- ❑ **32 % Borrelia:**
 - **16 % Borrelia afzelii**
 - **11 % Borrelia garinii**
 - **5 % Borrelia sensu stricto**
- ❑ **1 % Ehrlichia/Anaplasma**
- ❑ **42 % Rickettsia helvetica !!!**
(causes myalgia, pericarditis)

17 % of Borrelia contaminated ticks have additional Rickettsia
14 of 113 Lyme disease patients have Rickettsia symptoms
(mixed infections)!

Source: Lecture Prof. Sievers, Hochschule Wädenswil, 5.4.2008 Bad Soden-Salmünster

Laboratory for Lyme disease diagnosis



Caution major trap!

Lyme disease is not always detectable by antibody tests !

No standardization for antibody tests!

Sensitivity problems of ELISA technique !



The current *Borrelia* step diagnostic

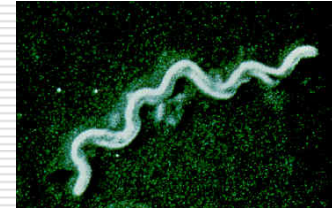
Serological test are performed in a two-tier concept (according to the recommendation of CDC):

First step: Screening of sera with the help of an Ig-class-specific **ELISA**

Second step: Confirmation of the ELISA positive or borderline sera with the help of an Immunoglobulin class-specific **immuno-blotting technique**

PROBLEM: The Immunoblot is more sensitive than the ELISA, i.e. the more specific test is also more sensitive,
High risk: Cases of positive Immunoblot but negative ELISA !

Immunoblot more specific than EIA? - current data facts



Antibodies in Lyme disease patients stage III:

Negative ELISA test with a positive Immunoblot

1. n=201 patients **8,99 %**
2. n=165 patients **18,80 %**

That means:

- Every 6th – 11th chronic Lyme patient has a positive immunoblot and no positive ELISA,
- i.e. a great number of patients will be not identified by the screening-test by ELISA-technique and consequently “excluded” for Lyme disease by diagnosing doctors!!!

(Source: Dr. Gebhardt, Laboratory Ettlingen 2005 und Mrs. Dr. Hopf-Seidel, Praxis in Ansbach 2006)

Laboratory example from practice: Negative EIA / Positive immunoblot

B-C-A GmbH & Co. KG · Morellstraße 33 · 86159 Augsburg

Laboratory results

Patient:

Date of birth: 08/09/1947

Date of testing: 07/08/2009

Antibodies (Humoral immune system)

	Results	Reference
Borrelia burgdorferi-IgG-EIA	2.8 RU/ml	<16
Borrelia burgdorferi-IgM-EIA	7.6 RU/ml	<16
Borrelia burgdorferi-IgG-Blot	positive Bands: OspC +, p41 +, VlsE-Bg +, VlsE-Ba +	
Borrelia burgdorferi-IgM-Blot	positive Bands: OspC-Bg +, OspC-Bb +, OspC-Ba +, p41 (+)	

Interpretation:

The specific Borrelia burgdorferi-IgG/IgM-antibodies by immunoblot-technique (false-negative EIA !) are an indication for a humoral immune-response against Borrelia burgdorferi in blood.

Armin Schwarzbach M.D. Ph.D.
Doctor for laboratory medicine

Case report 1: Chronic Lyme disease stage III: T-cellular immune response

43-year-old patient, since May 2005 suffering from

- persistent paraesthesia of the left leg
- 80% blindness of the left eye
- progredient myalgia
- recurrent dizziness
- substantial loss of power during work (threat of occupation disability)

First appointment in our laboratory practice at 10/26/2005

Spinal fluid and laboratory tests were negative (no Borrelia antibody AI, no chronic IgG synthesis in form of oligoclonal bands in spinal fluid!)

Several earlier Lyme tests of the humoral level (IgM/IgG-EIA as well as Immunoblot incl. VlsE) several different times negative

Initial findings Borrelia-LTT and CD57 count 26th Oct. 2005 before antibiotic treatment

Klinische Angaben: Diagnose unbek.

Material : EDTA, CPD Blut, CPD Blut, Heparinblut, Vollblut

Untersuchung	Ergebnis	Referenzbereich	
Leukozyten	↓ 4.2 x10 ³ /μl	4.4 - 11.3	IMP
Erythrozyten	4.11 x10 ⁶ /μl	4.1 - 5.1	IMP
Hämoglobin	12.7 g/dl	12.3 - 15.3	PHO
Hämatokrit	37.6 %	36 - 47	RECH
MCV	91.5 fl	80 - 99	RECH
HBE (MCH)	30.9 pg	26 - 34	RECH
MCHC	33.8 g/dl	31 - 36	RECH
Thrombozyten	243 x10 ³ /μl	140 - 400	IMP
Differentialblutbild			
Neutrophile	46 %	45 - 75	IMP
Lymphozyten	43 %	20 - 45	IMP
Monozyten	9 %	2 - 13	IMP
Eosinophile	↓ 1 %	2 - 4	IMP
Basophile	1 %	0 - 1	IMP
Sonstige Zellen	0 %		MIK
CD3- CD57+ Zellen	↓ 3.6 %	5 - 20	¹
(CD3-, CD57+ absolut)	65 /μl	60 - 360	RECH ¹
Eine Verminderung der Anzahl CD57+/CD3- Zellen kann für eine chronische Borreliose sprechen.			
Lymphozytentransformationstest			
Spontanaktivität	870 cpm	< 1000	LTT ¹
Ospc	↑ 30.1 SI	< 2.0	LTT ¹
P18-Antigen	↑ 4.8 SI	< 2.0	LTT ¹
P100-Antigen	↑ 8.1 SI	< 2.0	LTT ¹

B. burgdorferi-IgG-Blot
B. burgdorferi-IgM-Blot

negativ
negativ

BLOT
BLOT

Borrelia-LTT Jan 23rd 2006 after Ceftriaxon IV treatment (8 weeks after end of therapy)

At Jan 23rd, 2006 patient is clinical symptom-free and capable of work!

capable of v

Klinische Angaben: Borreliose		Material : CPD Blut, CPD Blut, EDTA, EDTA, Heparinblut, EDTA		
Untersuchung	Ergebnis	Referenzbereich		
Probennahme	—			
Großes Blutbild				
Leukozyten	4.6 x10 ³ /µl	4.4 - 11.3		IMP
Erythrozyten	4.34 x10 ⁶ /µl	4.1 - 5.1		IMP
Hämoglobin	13.1 g/dl	12.3 - 15.3		PHO
Hämatokrit	39.2 %	36 - 48		RECH
MCV	90.3 fl	80 - 99		RECH
HBE (MCH)	30.2 pg	26 - 34		RECH
MCHC	33.4 g/dl	31 - 36		RECH
Thrombozyten	271 x10 ³ /µl	140 - 400		IMP
Differentialblutbild				
Neutrophile	49 %	45 - 75		IMP
Lymphozyten	42 %	20 - 45		IMP
Monozyten	8 %	2 - 13		IMP
Eosinophile	↓ 1 %	2 - 4		IMP
Basophile	1 %	0 - 1		IMP
Sonstige Zellen	0 %			MIK
CD3 ⁺ CD57 ⁺ Zellen	1.3 %	5 - 20		
Ospc	↑ 2.2 SI	< 2.0		LTT 1
P18-Antigen	<1 SI	< 2.0		LTT 1
P100-Antigen	<1 SI	< 2.0		LTT 1
Deutlicher Abfall im Vergleich zum Vorbefund. Im Lymphozyten-Transformationstest konnten keine Borrelien-spezifischen aktivierten T-Zellen nachgewiesen werden. Der Befund bietet daher keinen Hinweis auf eine aktive Infektion. Bei der Diagnosestellung ist jedoch auch das klinische Bild zu berücksichtigen.				
Significant reduction in comparison to initial findings				
E				
Lyme-Borreliose				
B. burgdorferi-IgG-EIA	< 5 U/ml	< 5 negativ		EIA
B. burgdorferi-IgM-EIA	0.8 Index	5 - 10 grenzwertig		EIA
		< 1.3 negativ		EIA
		1.3 - 2.0 grenzwertig		
Kein serologischer Hinweis auf Infektion mit B. burgdorferi.				

Significant reduction in comparison to initial findings

Case report 2: “Mixed dementia” (1)

65-year old patient with ataxia in walking, fatigue, loss of memory and concentration, depressions, increasing disorientation, hypertension, panic attacks, helplessness, change of character since 2003. Patient remembers several tick bites before the start of the illness.

Feb. 3rd, 2005: University Hospital Munich: “Mixed dementia” with no findings in spinal fluid - “Exclusion of Neuroborreliosis”

Nov. 11th, 2006: Appointment at Borreliose Centrum Augsburg:

- Borrelia IgG-/IgM-specific antibodies detectable
- Elispot-LTT positive (Borrelia fully antigen: SI 3)

Dec. 2006 / Jan. 2007: Treatment for 10 weeks with oral antibiotic therapy: Cefuroxim, Clarythromycin and Metronidazol in a row

Case report 2: "Mixed dementia" (2)

April 2nd, 2007 Next consultation at BCA: increasing autonomy, significant improvement in ataxia und movement disorders, no panic attacks anymore

June 6th, 2007 Next consultation at BCA: condition remains stable, following treatment for 12 weeks with oral Donta treatment scheme (Clarythromycin und Hydroxychloroquin)

Nov. 11th, 2007: Next consultation at BCA:

- Borrelia serology IgG-/IgM- antibodies unchanged
- Borrelia Elispot-LTT negative (SI <2)!

Patient is healed!

Correct diagnosis: Chronic Neuroborreliosis with dementia-like symptoms

New options for patient groups ?

What diseases could be caused by Borrelia ?

- Chronic fatigue syndrome ?
- Multiple Sclerosis ? ALS ?
- Joint and muscle "Rheumatism" ?
- Arthrosis ?
- Fibromyalgia ?
- Morbus Parkinson ?
- Dementia ?
- Depression ?
- Thyroid and hormone disorders ?
- Infertility ?
- Heart rhythm disturbances ?
- Heart attack and stroke ?

Could Borrelia (tick bites) be the reason for it ?

LYME BORRELIOSIS: Great imitator

**Lyme is a spirochete disease,
similar to Syphilis.**

**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.)

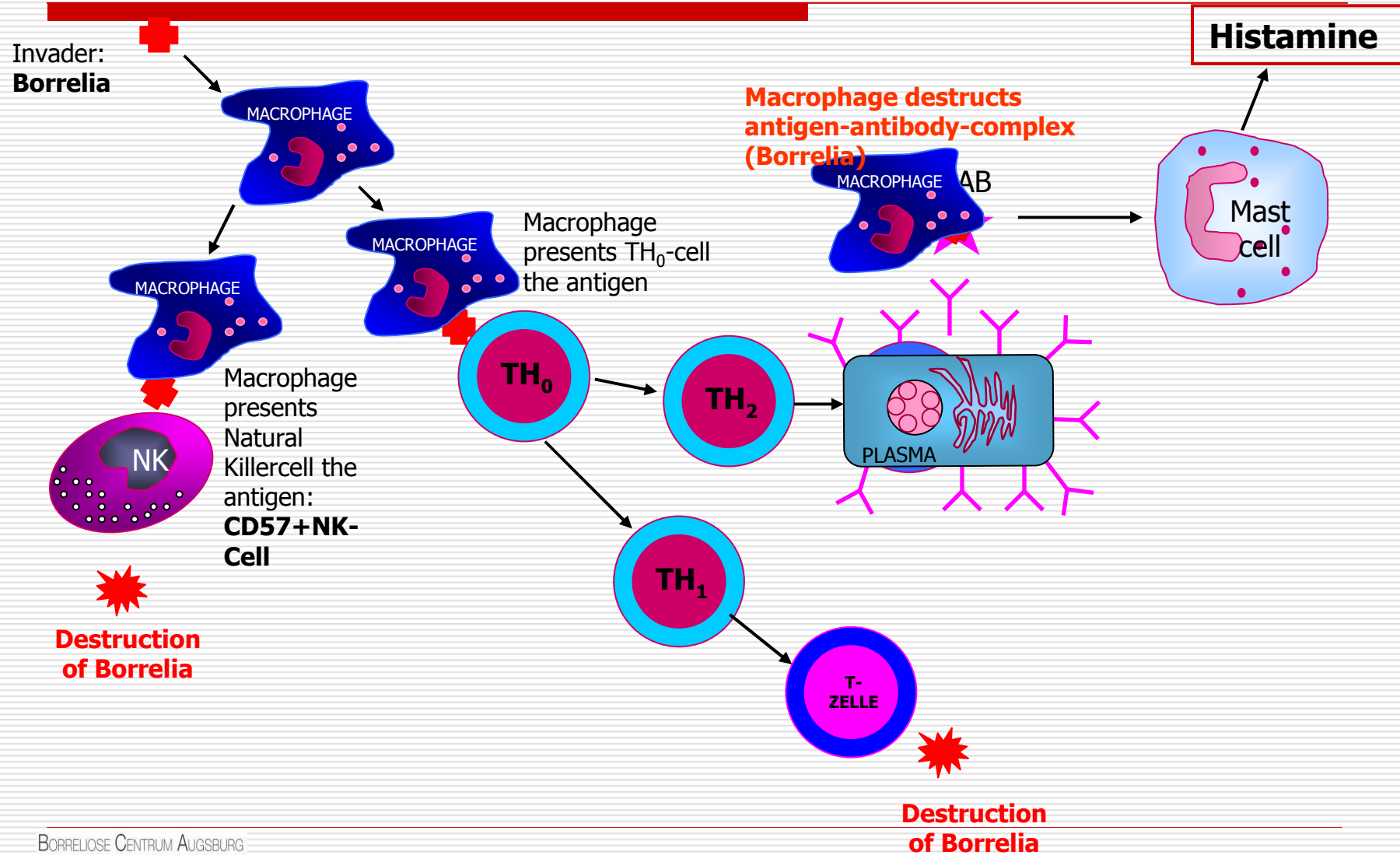
Borrelia can cause Parkinsonism

(Arch.of Path.& Lab.Med.127(9):1204-6)

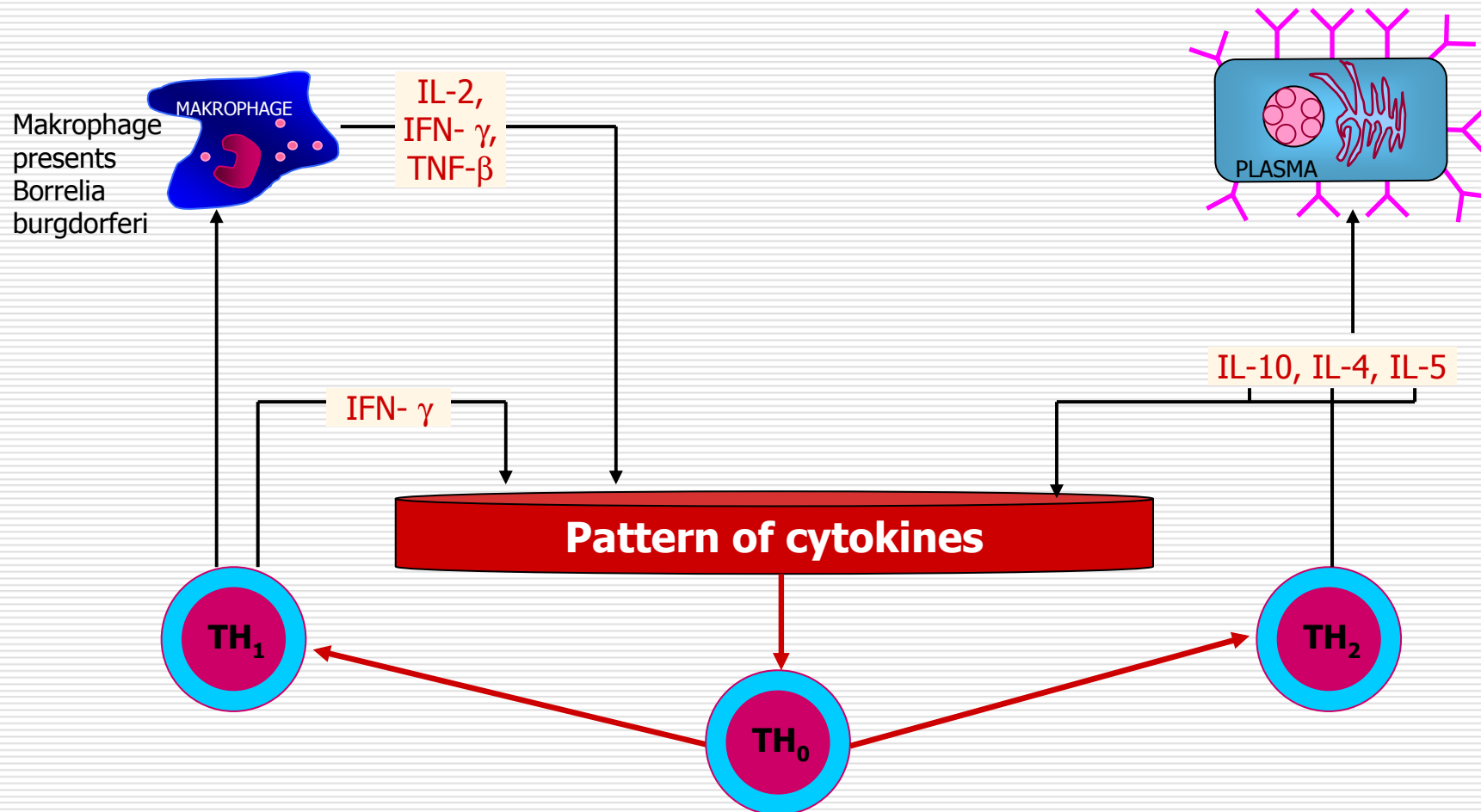
All sorts of heart disease

(Eur Heart J.1991 Aug;12 Suppl D:73-5)

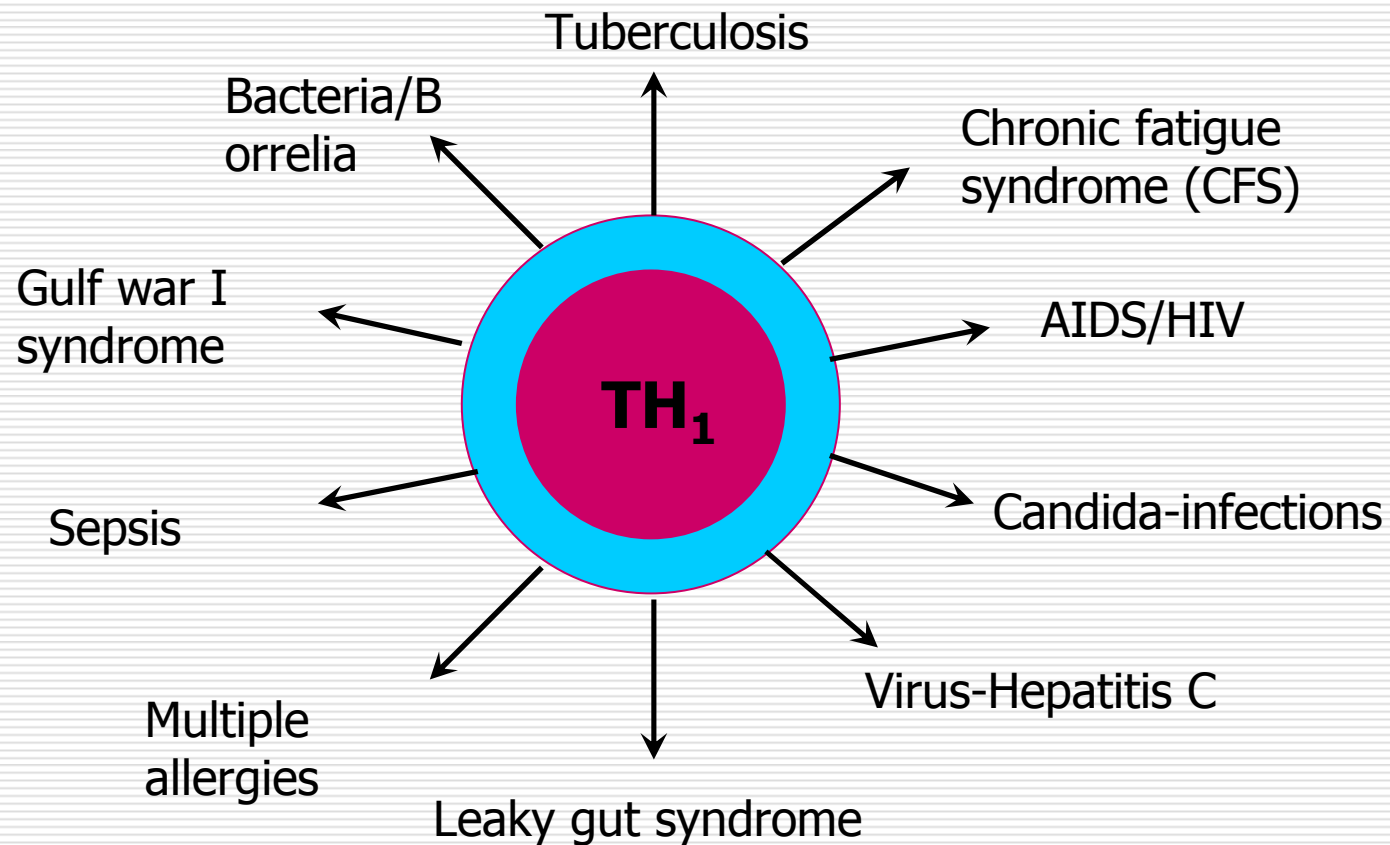
Immune defence principle



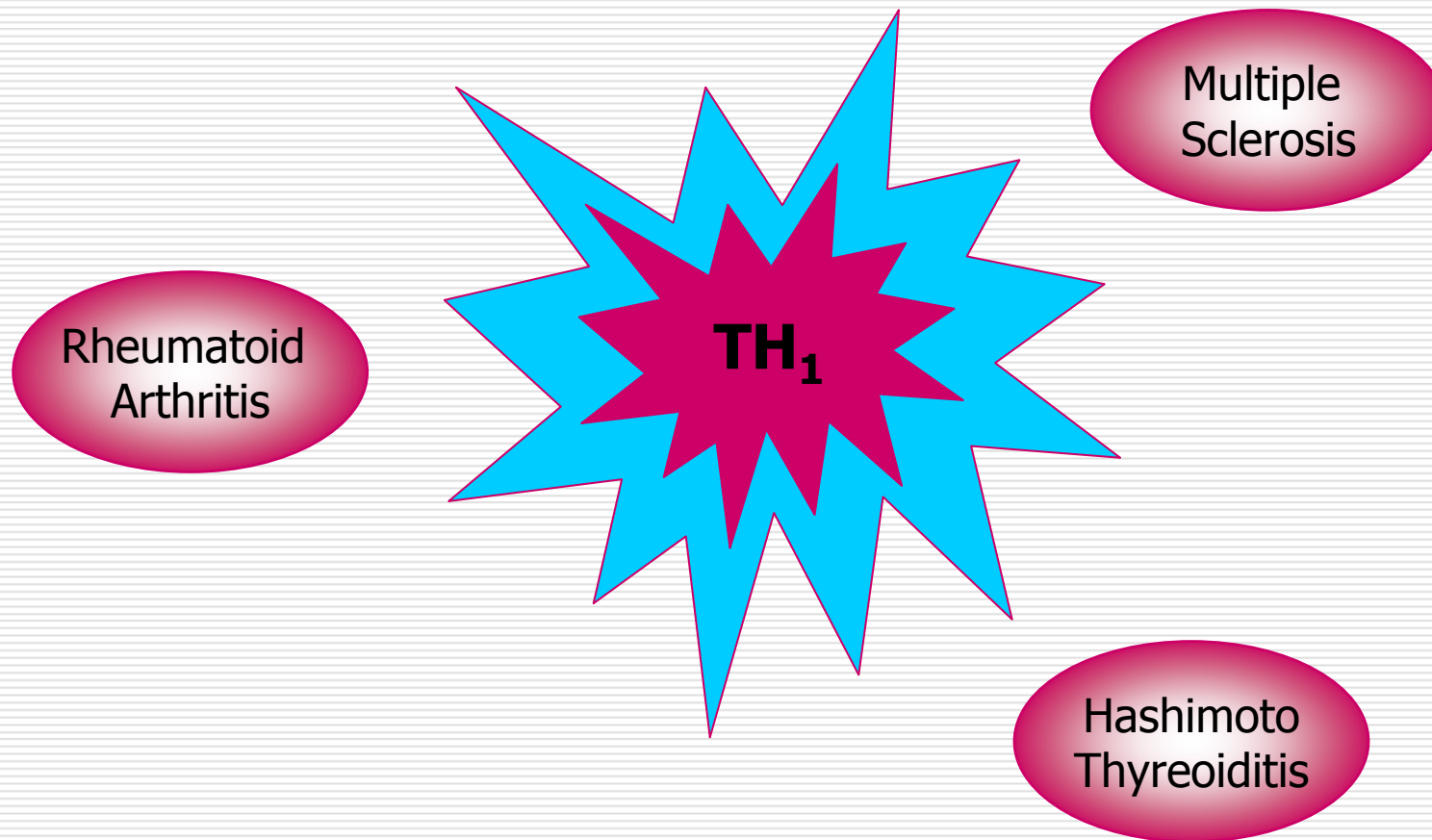
Differentiation of TH₁- and TH₂-cells by cytokines



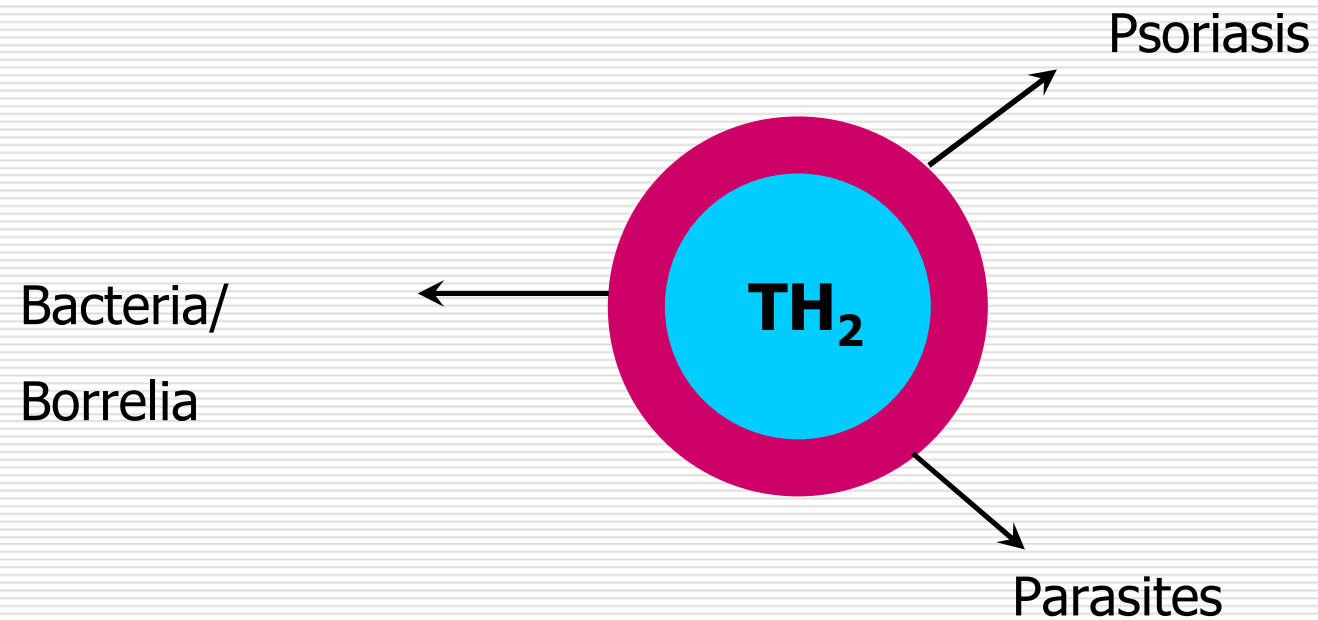
Effect of TH₁-cells in diseases



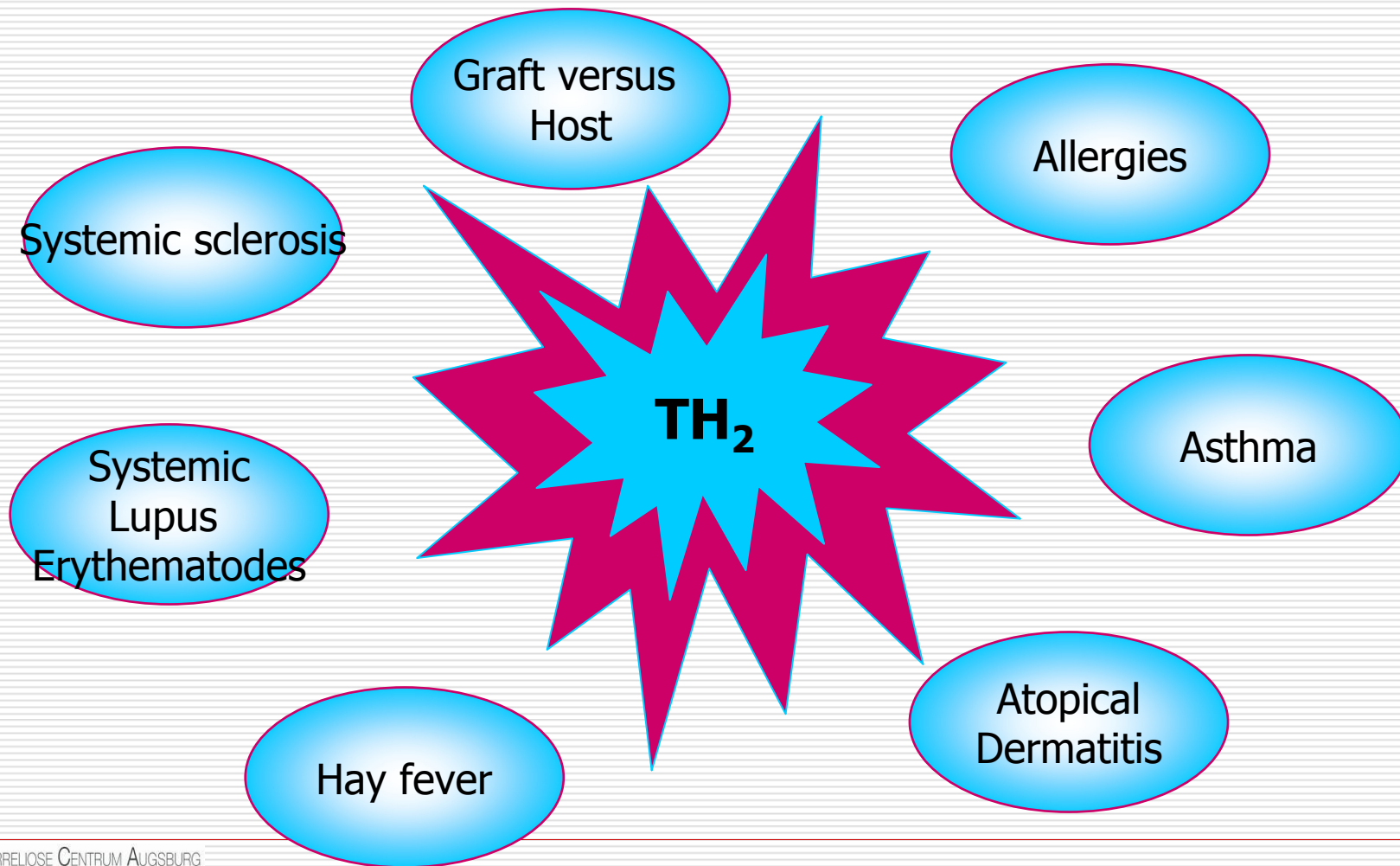
Diseases depending on overreactions of TH₁-cells



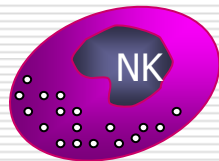
Effect of TH₂-cells in diseases



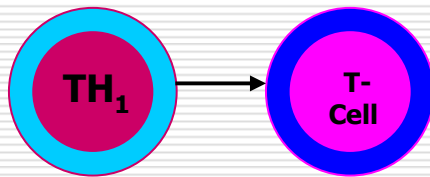
Diseases depending on overreactions of TH₂-cells



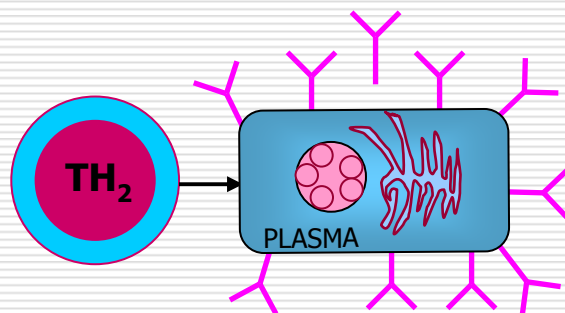
Aims of the immune-competent cells



- CD57+NK-cells
- Lysis antigen-antibody-complexes (Borrelia)

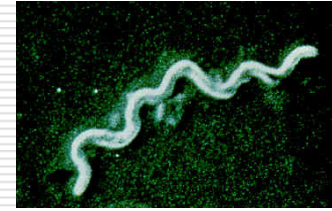


- Viruses/Borrelia
- Tumor cells
- Intracellular parasites



- Bacteria/Borrelia
- Extracellular parasites
- Intestinal parasites

Basic diagnostic tests for chronic Borrelia infection



1. **Borrelia IgM- and IgG- antibodies**
by immunoblot-technique incl. VlsE
2. **Borrelia Elispot (LTT)** Enzyme Linked Immuno Spot LTT
3. **CD3-/CD57+ T-Lymphocytes**
(Note: don't use in diagnosis of Lyme disease stage I !)

Basically all 3 tests for the diagnosis of suspected Lyme disease,
i.e. even with negative IgM-/IgG- antibodies.

**Earliest control 6-8 weeks after the end of therapy
to verify a successful therapy .**

Laboratory "STAGING" process

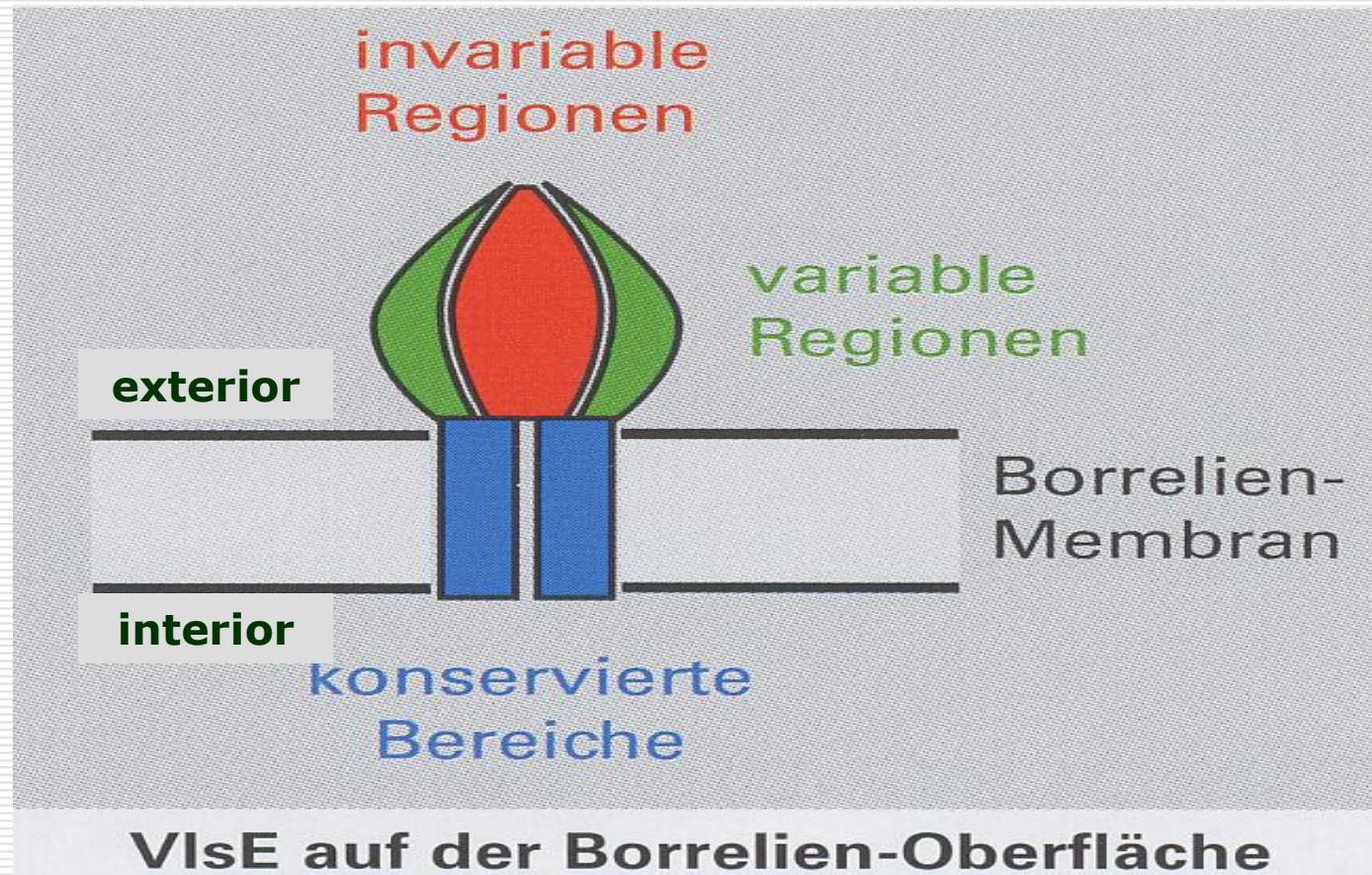
Specificity of antibodies against *Borrelia* by recombinant immunoblot (Specificity range: 95.3%-100%)

- Highly specific:
p100/83, p83-93, VlsE-Ba/Bb/Bg, Lipid-Ba/Bb, p58, p39(BmpA), OspC-Ba/Bb/Bg(p25), p24, p23, p21, p20, p19, p18, p17
- Specific: OspB(p34), OspA(p31), p39
- Unspecific: p41, p41i, hsp60, 66, 75

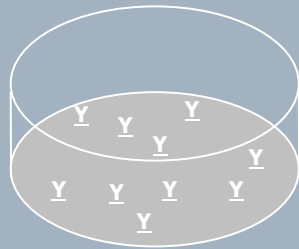
Explanation: Ba = *Borrelia afzelii*, Bb = *Borrelia burgdorferi sensu stricto*,
Bg = *Borrelia garinii*

The new surface marker VlsE: highly specific, "in vivo" activity associated

VlsE = Vmp-like sequences Expression site



Elispot-LTT: The principle (I)



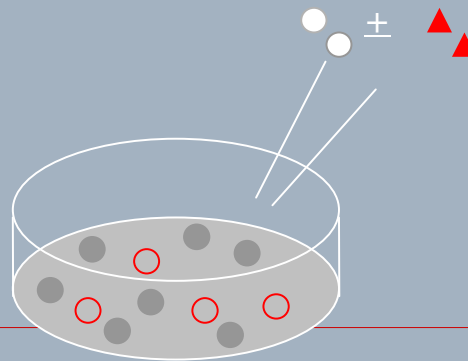
Elispot-well coated
with monoclonal, cytokine
specific antibody (IFN γ ,
IL10 etc.)



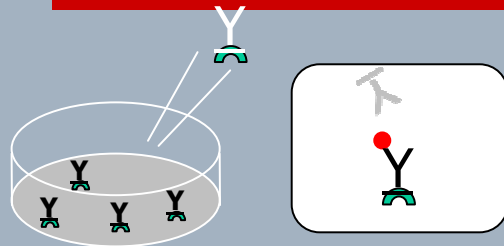
Lymphocyte-isolation



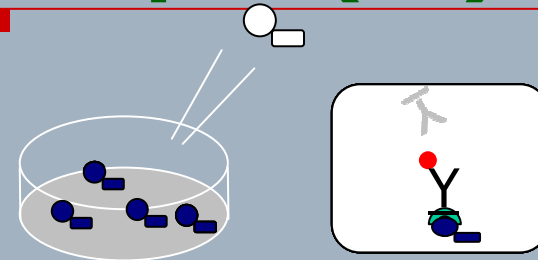
Incubation with cells and
antigen, specific cells
release cytokine



Elispot-LTT: The principle (II)



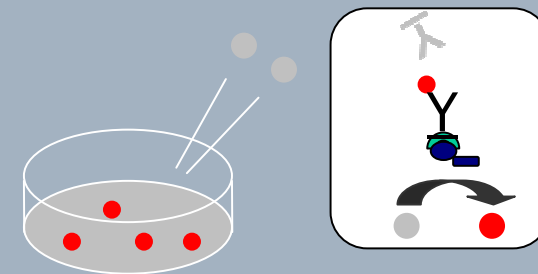
Add biotinylated secondary antibody Complex:
pr.AB/Cytokine/sec.AB



Add Streptavidin-enzyme conjugate

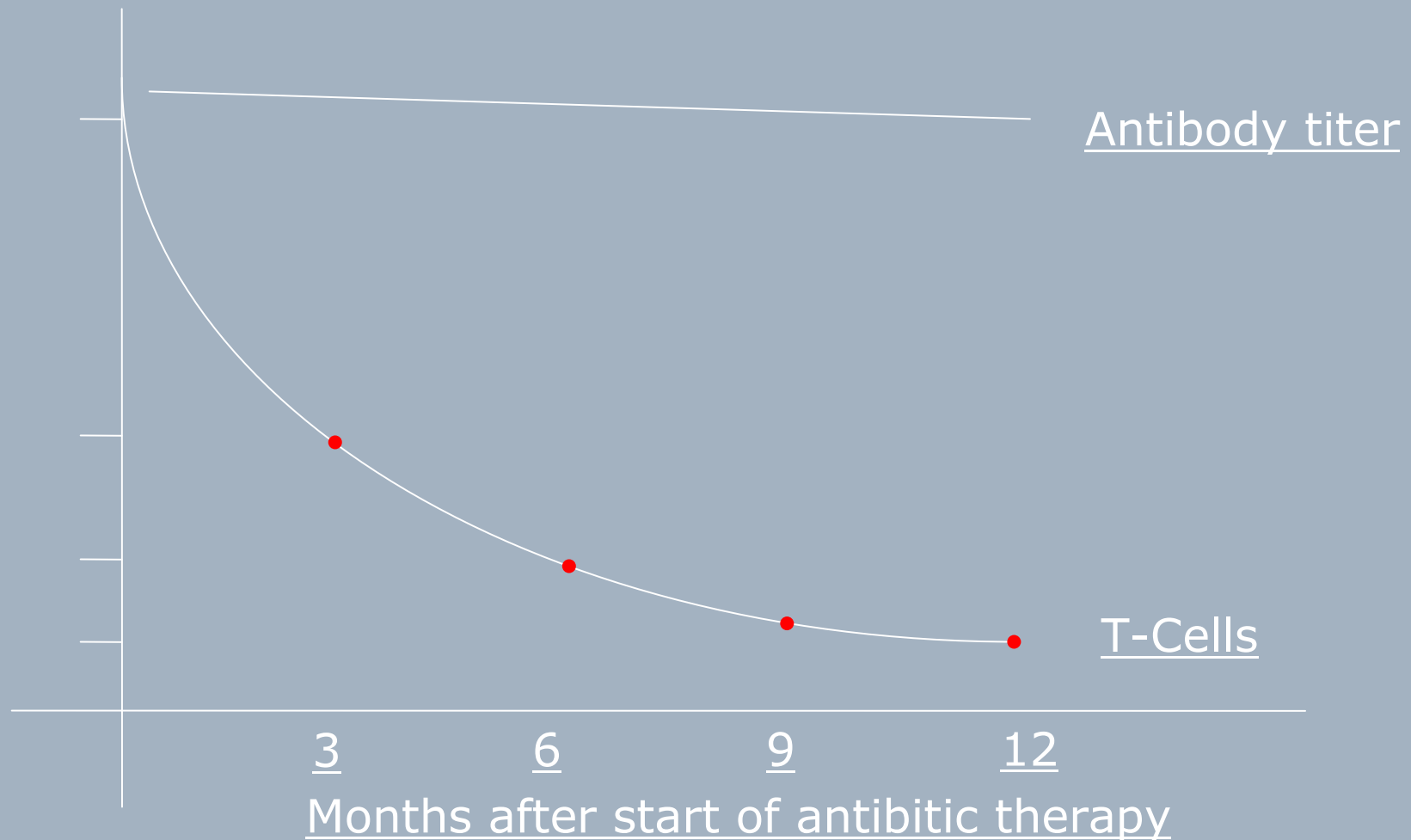


analysis

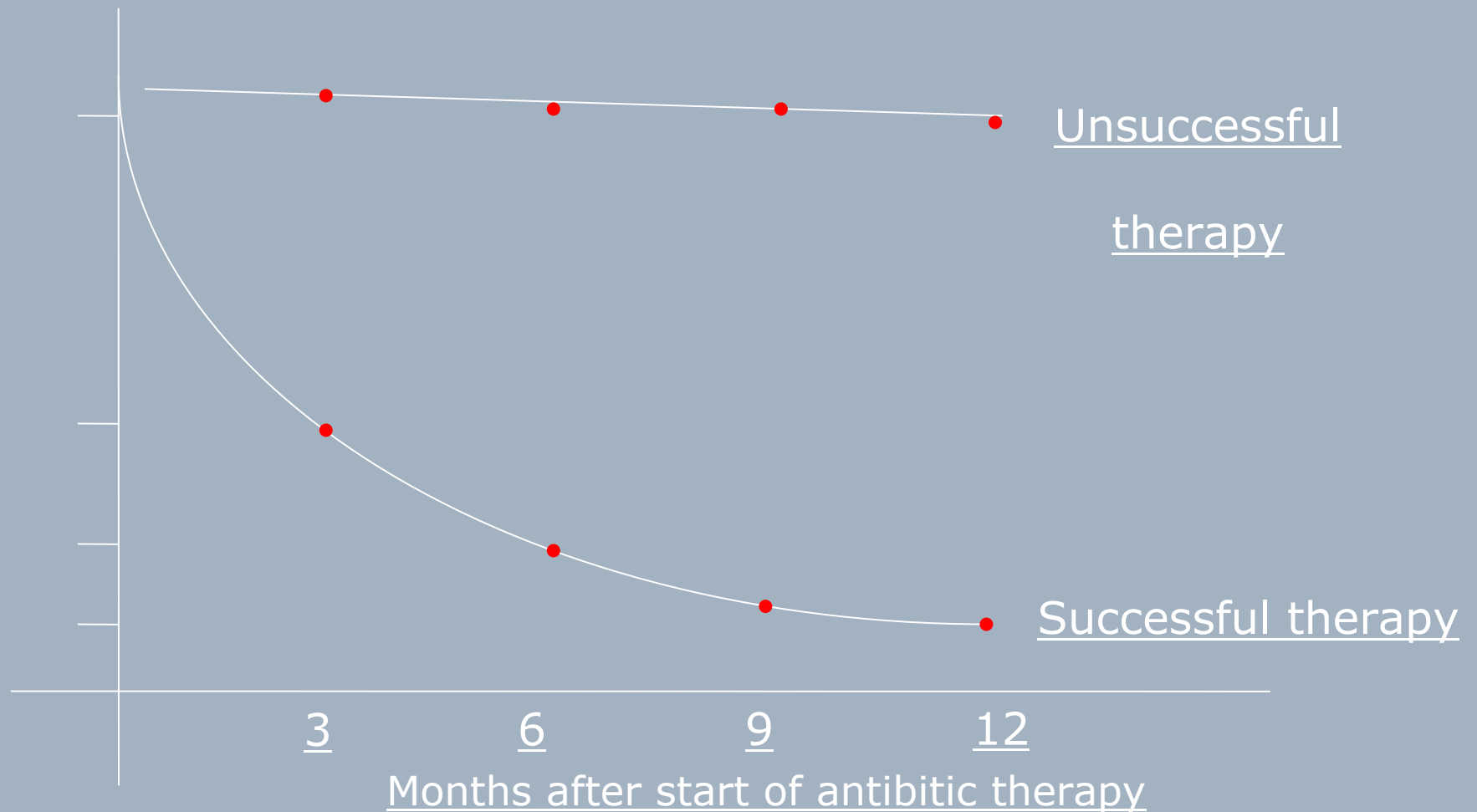


Add substrate color development

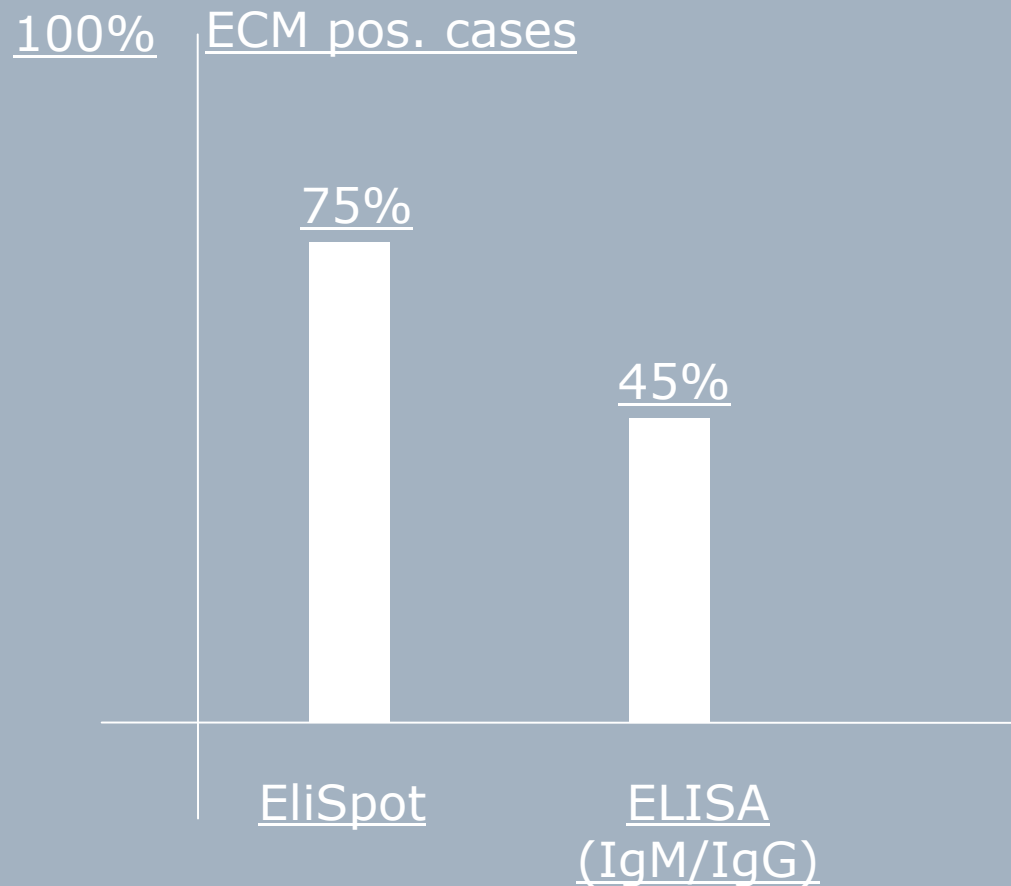
EliSpot-LTT during antibiotics: “Staging” process of activity



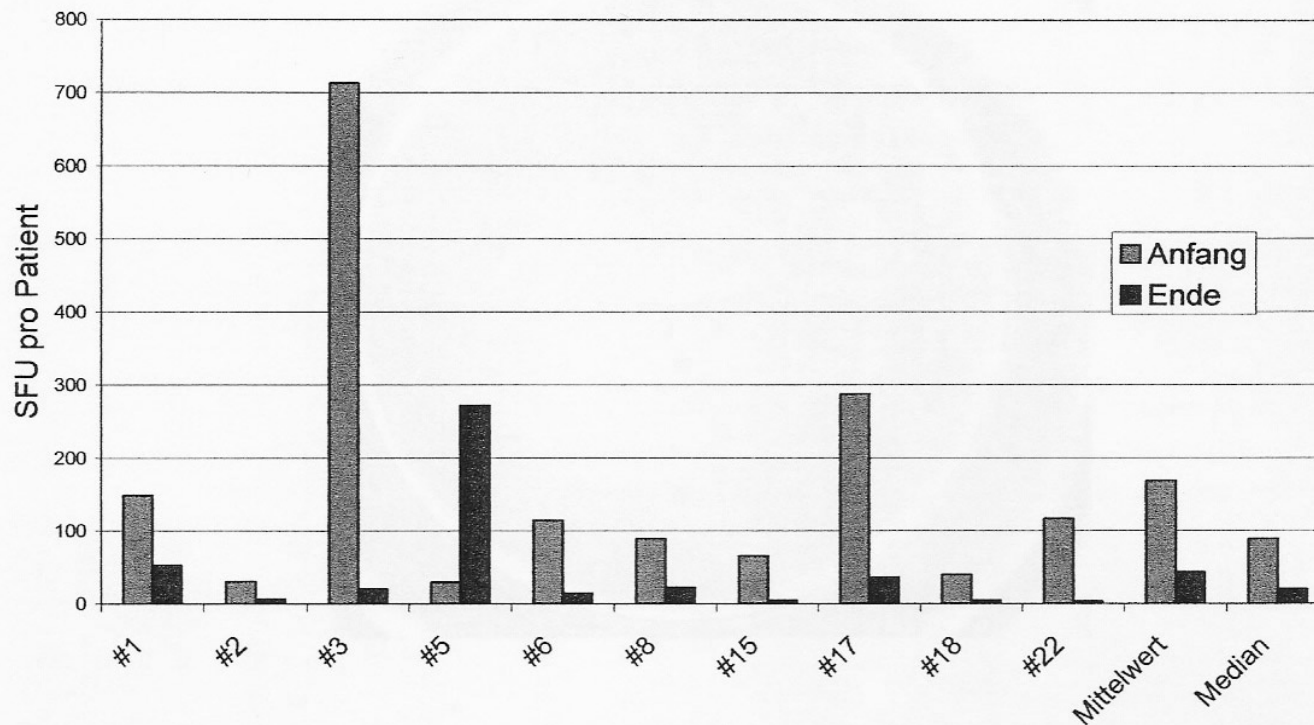
EliSpot-LTT during antibiotics: “Staging” process of activity



ELISA / EliSpot in Lyme stage I



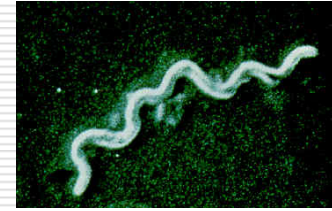
EliSpot-LTT in chronic Lyme disease



Grey columns: before antibiotic therapy

Black columns: after antibiotic therapy

Borrelia Elispot (LTT / T-Cell-test)



1. Ca. 14 days after tick bite already increase of T-cells (even in cases of negative IgM antibody titer)
 2. Success control of an antibiotic therapy - **STAGING**:
 - About 6-8 weeks after end of therapy already significant reduction
 - Borrelia IgM-/IgG- titer reduction often only after 6-12-months!
 3. Reflecting the activity of Lyme disease:
 - Indication for unhealed Borrelia infection in cases of furthermore positive Elispot LTT after the end of therapy
- Elispot-LTT is helpful in the decision of
- Length of antibiotic treatment ?
 - New treatment cycle ?

CD3-/CD57+ T-Lymphocytes

1. Subpopulation of NK cells
2. Reduction indicates chronic Lyme disease (symptoms > 1 year)
- not in cases of fresh Lyme disease !
3. Reduction in untreated and inadequately treated Lyme disease
4. After the therapy end of chronic Lyme disease: normalization
as an expression of therapeutical success
5. Reflection of a progressive (chronic) activity level of Lyme
disease

CD3-/CD57+ T-Lymphocytes

Reference range (mean/range)

Lyme patient: 46 /ul / 8 – 160 /ul

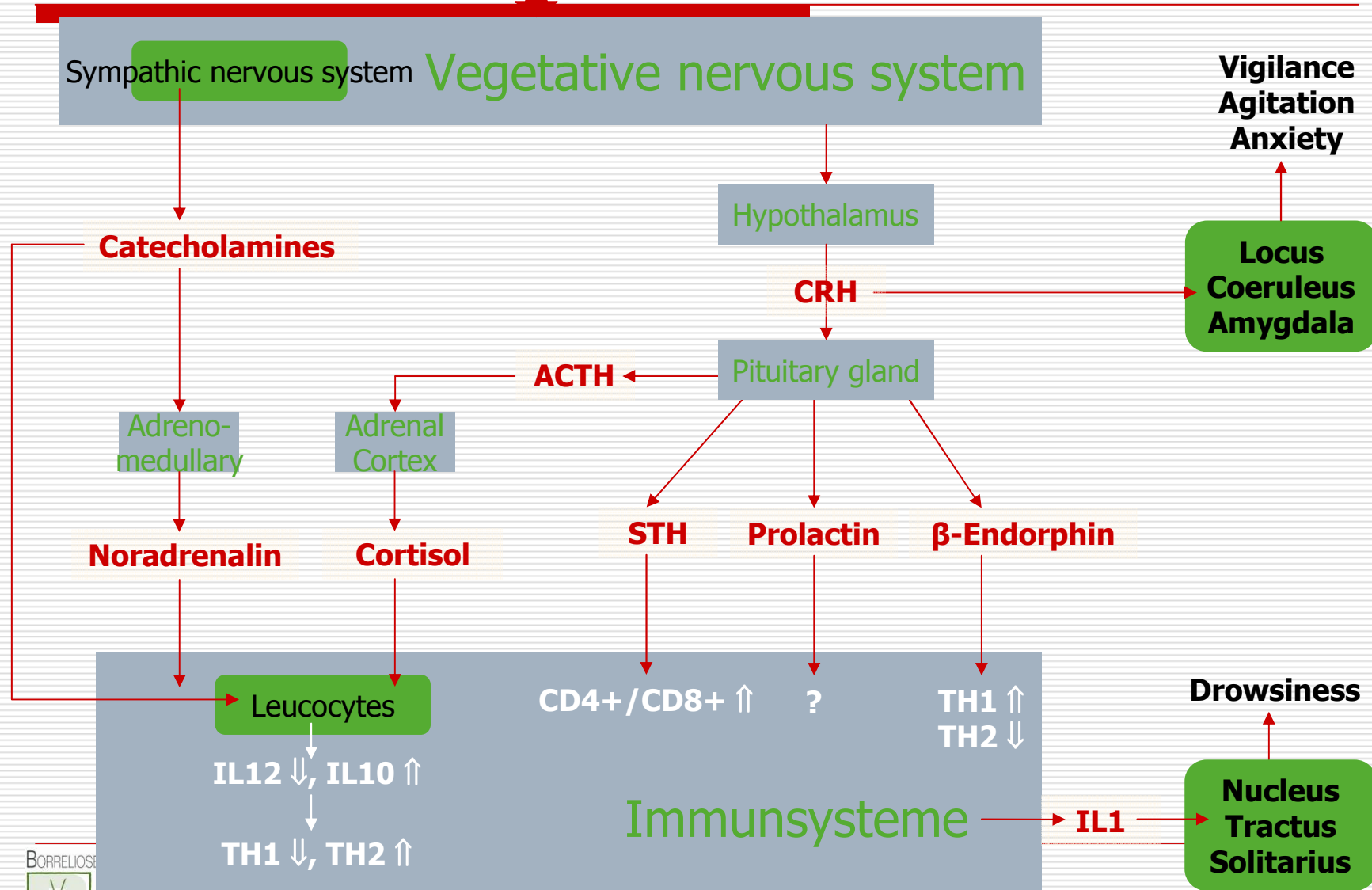
Healthy: 164 /ul / 60 – 354 /ul

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

Laboratory "Staging" for chronic Lyme disease

Screening	Immunoblots: IgG, IgM with VlsE Borrelia Elispot LTT CD3-/CD57+ NK cells ANA titer ("para"- infectious)
???	Enzymimmunoassays (ELISA): IgG,IgM, VlsE Direct detection of Borrelia by PCR technique
"STAGING" process before, during and after therapy	Borrelia Elispot/LTT (actual activity) CD3-/CD57+ NK cells (chronic activity) ANA, IL10, IFN-gamma, TFN-alpha

Stress (by infections)



BORRELIOSIS



Centrum für Zecken-übertragene Erkrankungen

Speech / presentation WASHINGTON D.C. Oct. 25th, 2009 (AS)

This document is intellectual property of Borreliose Centrum Augsburg (www.b-c-a.de); reproduction only with permission. Please note the copyright.



„After I studied your laboratory report, I would say

it is not the question, if you smoke or not.... „

LYME BORRELIOSE and CO-INFECTIONS

**Borrelia
burgdorferi**

+ Babesia

+ Bartonella

+ Ehrlichia

+ Chlamydia

+ Rickettsia/Coxiella

+ Mycoplasma

+ Viruses (EBV, CMV, HSV)

Ehrlichia / Anaplasma

Bacteria: Anaplasma phagocytophilum (gram-negative, obligatory intracellular in granulocytes)

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 (length: 1 up to 60 days) up to lethal ending, rarely diffuse vasculitic rash, including palms and soles (<10%)

Risk factors: older people, severe basic illness, immune suppression

Diagnosis Ehrlichia/ Anaplasma

Cellular activity test:

Ehrlichia/Anaplasma Elispot-LTT (Lymphocytes transformation test)

Ehrlichia/Anaplasma-DNS-PCR in blood (EDTA-blood): direct detection

Bacteria detection in Giemsa-blood smear

Antibodies: Ehrlichia-IgM and Ehrlichia-IgG: indirect detection – increase of antibody level !

Leucopenia / Thrombocytopenia / Anemia

Elevated liver enzymes

Ehrlichia/Anaplasma: Therapy

- ☐ Macrolides (Azithromycin, Clarythromycin)
- ☐ Tetracycline (Doxycycline, Minocycline)
- ☐ Quinolones (Ciprofloxacin, Levofloxacin)
- ☐ Rifampicin (During pregnancy!)

Babesia

Bacteria: Babesia microti, Babesia divergens

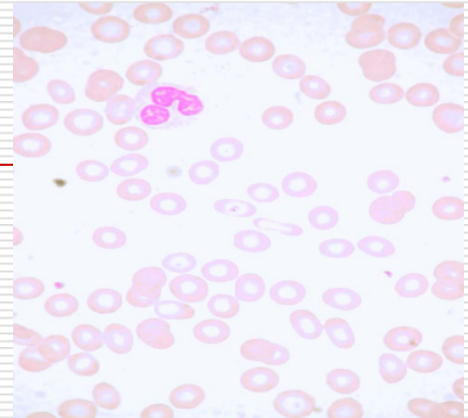
Vector/Transmission: Ixodes ricinus, blood transfusion

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 vise), 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 anemia, hemoglobinuria, seldom hepatosplenomegalia, muscle pain, dizziness, mental dullness and slowing of reactions and responses, hypercoaguability, stomach pain, emotional lability, „mental dullness“, kidney problems, dyspnoea, influenza like symptoms could be lethal!

Risk factors: Splenectomy, HIV, immune suppression, organ transplantation, older people



Babesia: Diagnosis

Babesia-DNS-PCR in blood (EDTA-blood): direct detection

Blood smear: direct detection

Antibodies of Babesia-IgM and Babesia-IgG: indirect detection – increase of antibody level !

Rarely:

- Hemolytic anemia (erythrocytes, haptoglobin)
- Thrombocytopenia
- Leucocytopenia
- Increase of liver enzymes (sGOT, sGPT, sGGT)
- Increase of Creatinine, Urea
- Hemoglobinuria

Babesia: Therapy

- ☐ Clindamycin
- ☐ Malarone 250/200 mg 1x/day
- ☐ Malarone junior 65/25 mg 1x/day
- ☐ Atovaquon 750 mg 2x/day
- ☐ Lariam 250 mg

Bartonella (cat scratch fever)

Bacteria: Bartonella henselae (gram-negative, optional intracellular in endothel-cells / erythrocytes) and/or **BLO = Bartonella like organisms**

Vector/Transmission: cat-scratch surface wounds, Ixodes ricinus

Symptoms (incubation time 3 – 38 days): headache (80%), tiredness (100%), amyostasia, muscle twitches, tremors, seizures, fever in the mornings (30%, in thrusts up to 6 weeks, otherwise 1 – 3 weeks), swollen lymphnodes, 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

Complications: endocarditis, retinitis, epilepsy, aseptic meningitis, hepatosplenomegalia

BLO: No or only minimal musculoskeletal symptoms (according to JJ. Burrascano)!

Risk factors: immune suppression



Speech / presentation WASHINGTON D.C. Oct. 25th, 2009 (AS)

This document is intellectual property of Borreliose Centrum Augsburg (www.b-c-a.de); reproduction only with permission. Please note the copyright.

Bartonella: Diagnosis

PCR on Bartonella in blood (EDTA): direct detection

Histology (hemangioma/lymphadenitis)

Antibodies on bartonella henselae-IgM and bartonella henselae-IgG: indirect detection evidence – increase of antibody level !

Elevated vascular endothelial growth factor (VEGF) seldom increased, but in such cases activity marker for monitoring

Bartonella: Therapy

- ☐ Macrolides (Azithromycin, Clarythromycin)
- ☐ Tetracycline/Doxycycline
- ☐ Quinolones (Ciprofloxacin, Levofloxacin)
- ☐ Rifampicin
- ☐ Ceftriaxone/Cefotaxime

Rickettsia

Bacteria: Rickettsia conorii, R. rickettsii, R. helvetica, R. slovaca, R. prowazekii (not gram-stainable, obligatory intracellular in endothel cells)

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

Symptoms (incubation period 5 - 7 days): fever, lymphadenitis, exanthema

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

Rickettsia: Diagnosis

PCR on Rickettsia in blood (EDTA-blood): direct detection

Antibodies Rickettsia-IgM and -IgG: indirect detection – increase of antibody level !

Rickettsia: Therapy

- ☐ Doxycyclin/Tetracyclin
- ☐ Ciprofloxacin
- ☐ Chloramphenicol
- ☐ Erythromycin (Children)

Chlamydia pneumoniae infection

Bacteria: Chlamydophila pneumoniae (gram-negative, intracellular)

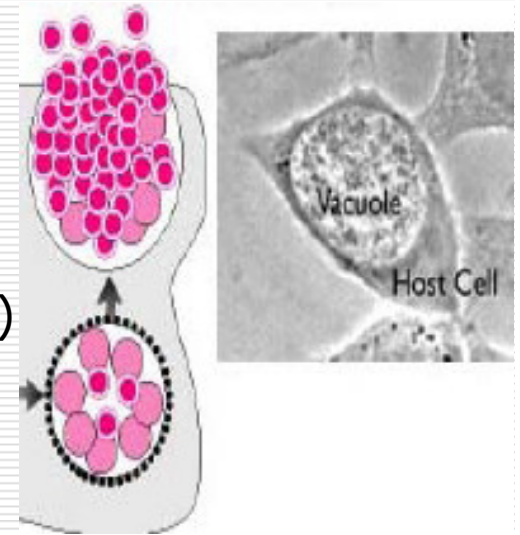
Vector/Transmission: airborne infection (aerogen), human to human, affection of epithelial cells of air passages, ticks ? (horses, koalas, frogs are infected)

Symptoms: slight throat pain, hoarseness, sinusitis, atypical pneumonia, meningoencephalitis, bronchiolitis obliterans, myocarditis, Guillain-Barre-Syndrom

After infection (4-6 weeks): arthritis, tendovaginitis

Associations: e.g. Morbus Alzheimer, Multiple Sclerosis, Fibromyalgia, Chronic Fatigue Syndrome (CFS), problems with prostate gland, heart attacks, apopleptic stroke, arteriosclerosis

Risk factors: immune suppression



Chlamydia pneumoniae: Diagnosis

Cellular activity test:

Chlamydia pneumoniae Elispot-LTT (Lymphocytes transformation test)

PCR of Chlamydia pneumoniae in sputum/pharyngeal secretion:
direct detection

Antibodies for Chlamydia pneumoniae-IgA and chlamydia pneumoniae-IgG: indirect detection – increase of antibody level !

Chlamydia pneumoniae: Therapy

- ☐ Macrolides (Azithromycin, Clarythromycin)
- ☐ Doxycyclin
- ☐ Levofloxacin

Chlamydia trachomatis infection

Bacteria: Chlamydophila trachomatis (gram-negative, intracellular)

Carrier: sexual contact, human to human

Clinic: cervicitis, sterility, urethritis, trachoma, acute conjunctivitis („swimming pool conjunctivitis“), lymphogranuloma venereum

After infection(4-6 weeks): arthritis, tendovaginitis

Risk factors: immune suppression

Chlamydia trachomatis: Diagnosis

Cellular activity test:

Chlamydia trachomatis Elispot-LTT (Lymphocytes transformation test)

PCR of Chlamydia trachomatis in urine/urogenital smear: direct detection

Antibodies for Chlamydia trachomatis-IgA and Chlamydia trachomatis-IgG: indirect detection – increase of antibody level !

Chlamydia trachomatis: Therapy

- ☐ Macrolides (Azithromycin, Clarythromycin)
- ☐ Doxycyclin
- ☐ Tetracycline
- ☐ Levofloxacin, Ciprofloxacin, Moxifloxacin

Co-treatment of sexual partners !

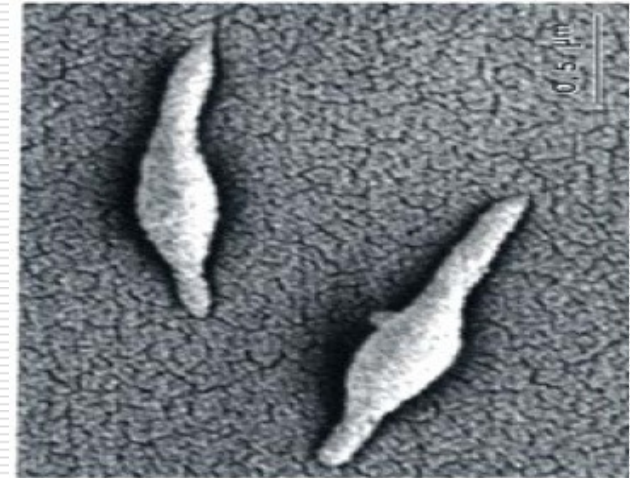
Mycoplasma infection

Bacteria: Mycoplasma pneumoniae/fermentans
(gram-positive, intracellular)

Transmission: airborne infection (aerogen),
human to human

Symptoms: tiredness (100%), fever, joint pain,
swelling of joints, muscle pain, headache,
insomnia, anxiety, emotional lability, lack of
concentration, alertness and memory,
confusion

Risk factors: immune suppression (e.g. AIDS),
Chronic Fatigue Syndrome (CFS), „Gulf War I
syndrome“



Mycoplasma: Diagnosis

Bacterial culture in special nutriment medium

PCR of *Mycoplasma pneumoniae* in sputum/secretion: direct detection

Antibodies: *Mycoplasma pneumoniae*-IgM, *Mycoplasma pneumoniae*-IgA and *Mycoplasma pneumoniae*-IgG: indirect detection – increase of antibody level !

Mycoplasma: Therapy

- ☐ Macrolides (Azithromycin, Clarythromycin)
- ☐ Doxycyclin
- ☐ Levofloxacin, Ciprofloxacin

Practical example

Laboratory results

Patient:	Date of birth:	Date of testing:
CD3-/CD57-NK-Cell-Tes	Result	Reference
	31 /ul	>100 /ul
Chlamydia pneumoniae antibodies		
Chl. pneumoniae-IgG-EIA	65 U/ml	<22 U/ml
Chl. pneumoniae-IgA-EIA	44 U/ml	<22 U/ml
Elispot-LTT for Borrelia	Results	Reference
Borrelia Fully antigen	SI 18	< 2
Borrelia Peptide-Mix	SI 7	< 2
Borrelia LFA-1	SI 5	< 2
Elispot-LTT for Chlamydia	Results	Reference
Chlamydia pneumoniae	SI 28	< 2

Interpretation:

The results of lymphocyte transformation test is an indication for an actual cellular activity against *Borrelia burgdorferi* and *Chlamydia pneumoniae* in blood. The results of *Chlamydia pneumoniae* IgG/IgA-antibodies are an indication for a contact with *Chlamydia pneumoniae*. The CD57 count is an indication for a persistent chronic Lyme infection. **In a summary there is a cellular and humoral activity against *Chlamydia pneumoniae* and an actual and chronic cellular activity against *Borrelia burgdorferi* in blood.**

Armin Schwarzbach M.D.
Doctor for Laboratory Medicine, specialist in tick-borne diseases
Borreliose Centrum Augsburg

Other complicating / reactivated viruses or bacteria

- ☒ Yersinia enterocolitica
- ☒ Herpes simplex Virus Typ I/II
- ☒ Cytomegalie-Virus
- ☒ Toxoplasma
- ☒ Epstein-Barr-Virus
- ☒ Borna-Virus
- ☒ Hepatitis C-Virus
- ☒ Cocksackie-Virus

Responsibility ?!



Borreliose Centrum Augsburg

Center for tick-borne diseases and co-infections

**Thank you very much for
your attention !**



Armin Schwarzbach M.D. Ph.D.
Specialist for laboratory medicine

Morellstrasse 33

86159 Augsburg (Germany)

Tel. +49 (821) 455471-0

www.borreliosecentrum.de

service@borreliosecentrum.de



BORRELIOSE CENTRUM AUGSBURG
CENTRUM FÜR ZECKEN-ÜBERTRAGENE ERKRANKUNGEN



RANGE OF SERVICES

Laboratory
Laboratory
transmittals
Therapies
Day medical clinic
Accompanying
therapies
Dietary supplement
Self help
Prevention/vaccination
Risk groups

Range of services

The range of competence and services at the BCA in cooperation with the „Medical Partnership“ cover:

1. Treatment of the Lyme disease in acute stage (i.e. right after the tick bite)
2. The treatment of the Lyme disease in chronic progression (especially in stages of severe progression of the disease)
3. Treatment of co-infections
4. Pain therapy of the Lyme disease in the second stage and during chronic progressions
5. Mental strengthening and medical health coaching

We offer a unique diagnosis and therapy concept to the patients: diagnosis, laboratory, therapy and rehabilitation all under one roof. The treatments are offered either as singular treatments or as "day

BORRELIOSE CENTRUM AUGSBURG



Centrum für Zecken-übertragene Erkrankungen

Speech / presentation WASHINGTON D.C. Oct. 25th, 2009 (AS)

This document is intellectual property of Borreliose Centrum Augsburg (www.b-c-a.de); reproduction only with permission. Please note the copyright.