

Infektforum 09. Dez 2010

**Die MRZ-Reaktion (Masern-Röteln-Zoster) in der
Differentialdiagnostik infektiöser und entzündlich-
demyelinisierender ZNS Erkrankungen**

Detlev Schultze

Institut für Klinische Mikrobiologie und Immunologie

Gruppen

Erbkrankheiten

Hypoxie und Ischämie

Nahrungsmittelmangelzustände

Virus Invasion

Primär Demyelinisierende
Erkrankungen

Beispiele

Phenylketonurie

Carbon monoxide toxicity and
other syndromes

Vit. B12 Mangel

Progressive Multifokale
Leukencephalopathie

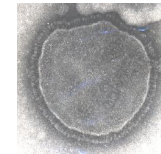
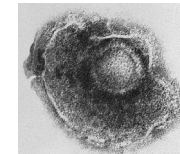
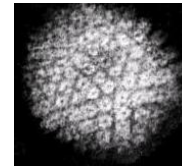
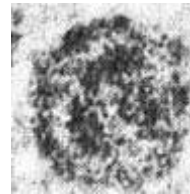
MS mit Varianten

NMO

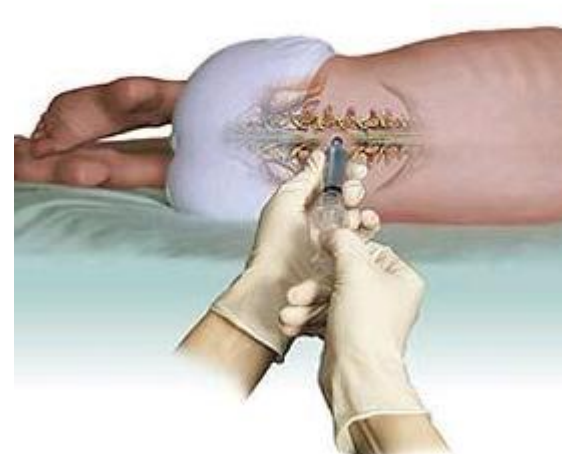
Monophasische KH
(Optikusneuritis, Akute
transverse Myelitis, akute
hämorr. Leukencephalitis)

Multiple Sklerose (MS)

- polyspezifische B-Zell Antwort gegen neurotrope Viren
 - Masern Virus
 - Röteln Virus
 - Varizella zoster Virus
 - Herpes simplex Virus
 - und andere



- Anti-Virus Antikörper messbar im Liquor als MRZ Reaktion



- Komplexe DD
- Definitive Diagnose durch Verlauf
- Labordiagnostik
→ minor criteria
- zB OCB IgG
- MRZ Reaktion Ø gewertet

Klinik	Zusatzinformationen
1. ≥ 2 Schübe mit ≥ 2 Läsionen (objektiv)	<i>Keine erforderlich</i> , aber Paraklinik darf nicht negativ sein
2. ≥ 2 Schübe mit 1 Läsion (objektiv)	<i>Räumliche Dissemination</i> <ul style="list-style-type: none"> • im MRT (Barkhof-Kriterien) oder • ≥ 2 MRT-Läsionen + Liquor oder • weiterer klinischer Schub mit anderer Lokalisation
3. 1 Schub mit ≥ 2 Läsionen (objektiv)	<i>Zeitliche Dissemination</i> <ul style="list-style-type: none"> • im MRT oder • weiterer klinischer Schub
4. 1 Schub mit 1 Läsion (objektiv) „monosymptomatische Erstmanifestation“ „klinisch isoliertes Syndrom“	<i>Räumliche Dissemination</i> <ul style="list-style-type: none"> • im MRT (Barkhof-Kriterien) oder • ≥ 2 MRT-Läsionen + Liquor und <i>Zeitliche Dissemination</i> <ul style="list-style-type: none"> • im MRT oder • weiterer klinischer Schub
5. primär progressive MS (schleichende Progression seit Beginn)	<i>Liquor</i> und <i>Räumliche Dissemination</i> <ul style="list-style-type: none"> • ≥ 9 Hirnläsionen oder • ≥ 2 Rückenmarksläsionen oder • 4–8 Hirn- und 1 Rückenmarksläsion oder • VEP + 4–8 Hirnläsionen oder • VEP + <4 Hirn- und 1 Rückenmarksläsion und <i>Zeitliche Dissemination</i> <ul style="list-style-type: none"> • im MRT oder • kontinuierliche Progression über 1 Jahr

Multiple Sklerose-Diagnostik

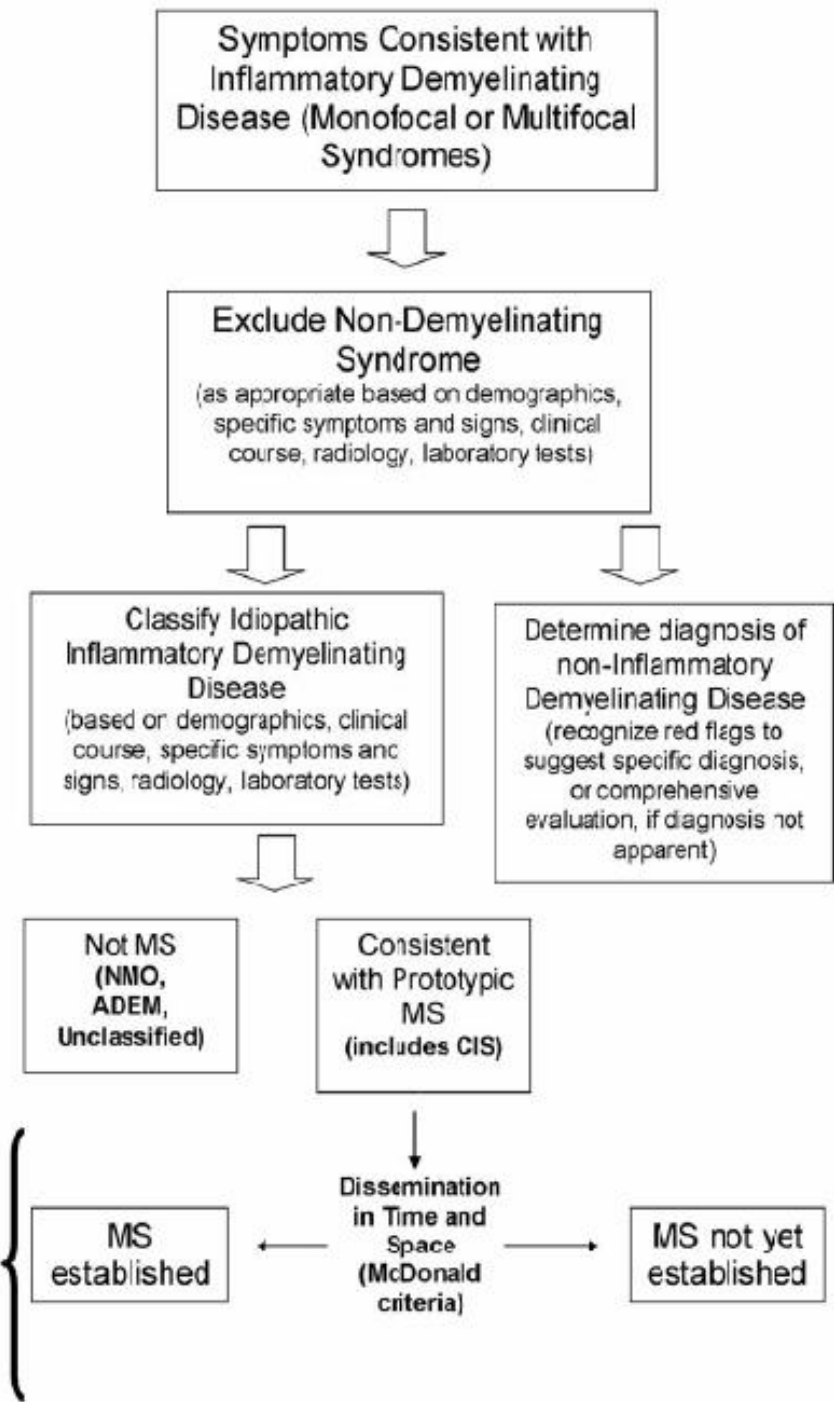
- DD mit 79 ‚red flags‘
 - infektiös ?
 - neoplastisch ?
 - metabolisch ?
 - vaskulär ?



Red flag	Type	Examples of alternative diagnosis
Bone lesions	Clinical	Histiocytosis; Erdheim Chester disease
Lung involvement	Clinical	Sarcoidosis; Lymphomatoid granulomatosis
Multiple cranial neuropathies or polyradiculopathy	Clinical	Chronic meningitis, including sarcoidosis and tuberculosis; Lyme disease
Peripheral neuropathy	Clinical	B12 deficiency; adrenoleukodystrophy; metachromatic leukodystrophy, Lyme disease

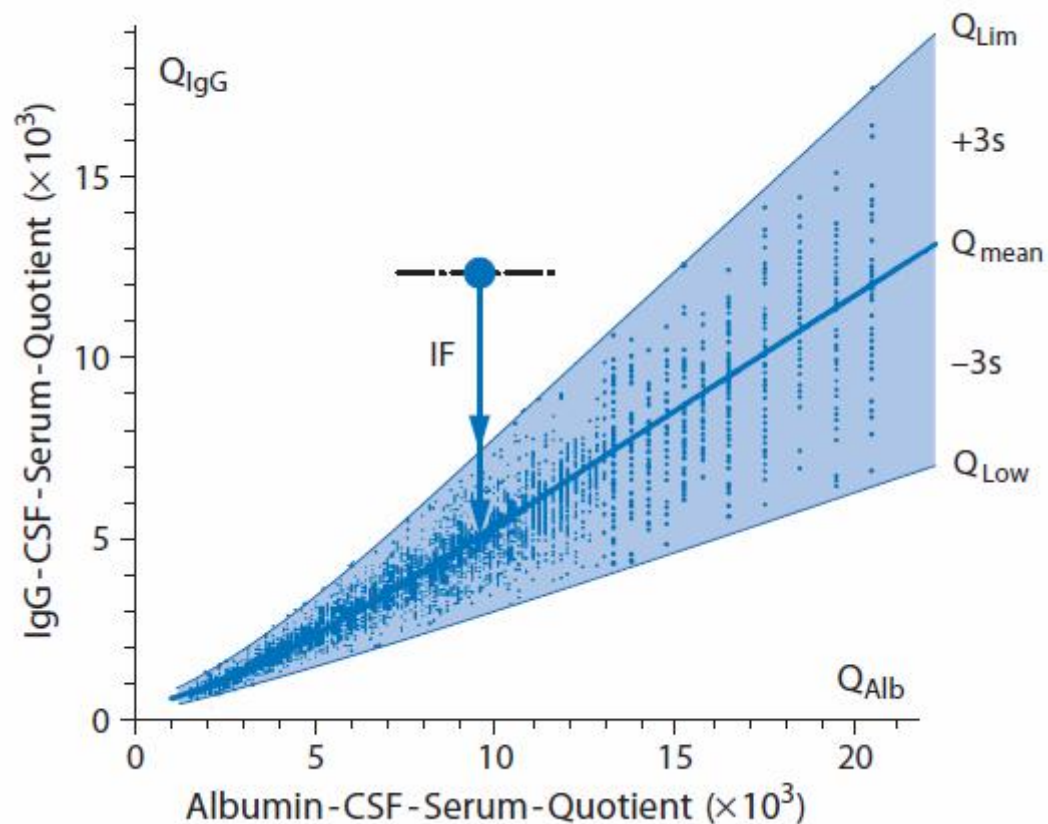
New diagnostic pathway -- enhanced evaluation of "no better explanation" caveat in existing diagnostic criteria

Historic pathway for MS diagnosis



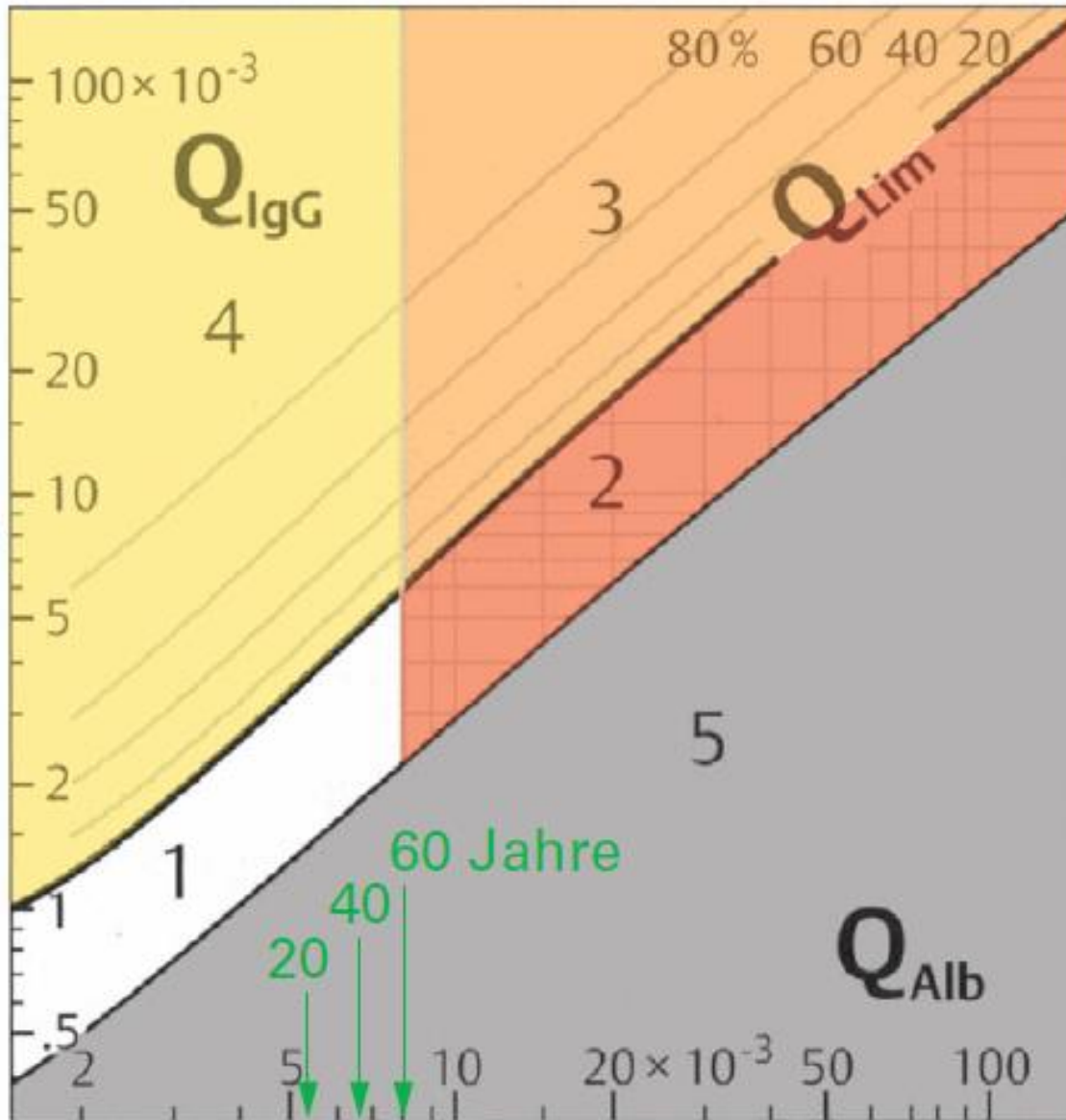
Intrathekale Synthese von Antikörpern

- qualitativ → oligoklonales IgG
- quantitativ → IgG / IgM / IgA -Index



Q_{IgG} – intrathekale Fraktion

Intrathekale IgG Synthese - Reiber Diagramm



- Referenzbereich der Normalwerte, intakte Schrankenfunktion
- Störung der Schrankenfunktion, keine Ig-Produktion im ZNS
- Störung der Schrankenfunktion, zusätzliche Ig-Produktion im ZNS
- Reine Ig-Produktion im ZNS, keine Störung der Schrankenfunktion
- Fehler bei Blutentnahme oder Analytik

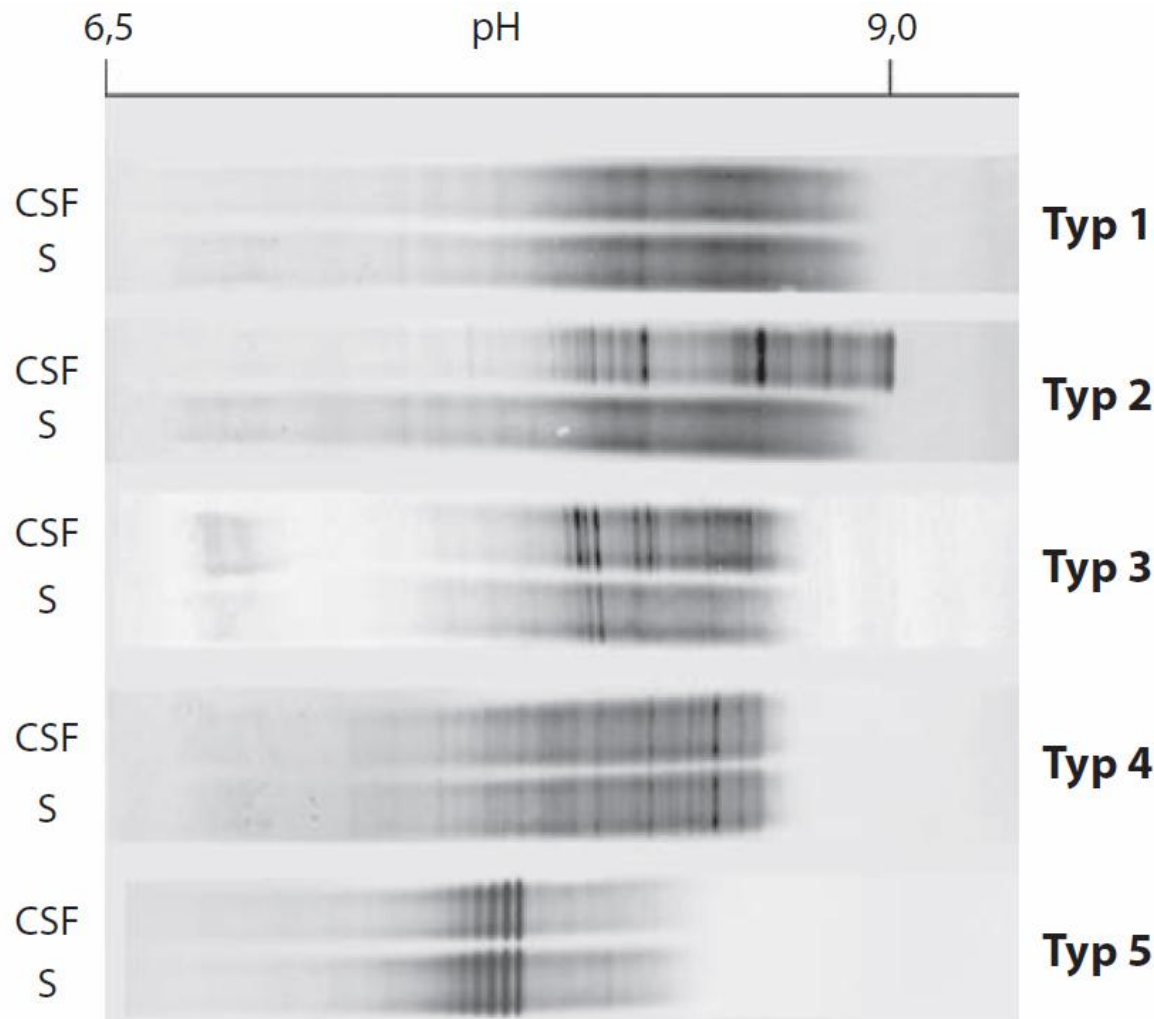
Altersabhängiger LSQ_{Alb} -Grenzwert = $\text{Alter}/15+4$

Intrathekale IgG Synthese - Diagnostik

	IgG (%)	IgA (%)	IgM (%)
No inflammatory and no CNS disease	< 5	< 5	< 5
Non-inflammatory CNS disease (including degenerative and vascular diseases)	< 25 ^a	< 5	< 5
Infections of the nervous system	25–50	25	25
Bacterial infections	25–50	25–50	< 25
Viral infections	25–50	< 25	< 25
Lyme neuroborreliosis	25–50	< 25	75
Multiple sclerosis	70–80	< 25	< 25
Clinically isolated syndromes	40–60	< 10	< 25
Inflammatory neuropathies	25–50 ^a	25–50 ^a	25–50 ^a
Neoplastic disorders (in general)	< 25 ^a	ND	ND
Paraneoplastic syndromes	< 25	ND	ND
Meningeal carcinomatosis	25–50	ND	ND
Other neuroinflammatory diseases	25–50 ^b	ND ^c	ND

CNS, central nervous system; ND, not determined in larger studies using non-linear immunoglobulin formulae. ^aUsually not associated with oligoclonal bands (artefact in presence of barrier impairment); ^bRare in biopsy-proven neurosarcoidosis; ^cProminent IgA synthesis in adrenoleukodystrophy.

Oligoklonale Banden (OCB-IgG) - polyspezifisch



- **Qualitativ**
- **Empfindlicher als quantitative Messung ($\geq 0.5 \% \text{ IgG}_{\text{IF}}$)**

<oligoklonales IgG>

historisch: einzelne Banden → <oligo> Zellklone?

Banden → AK polyspezifisch, gerichtet gegen > 1 Antigen

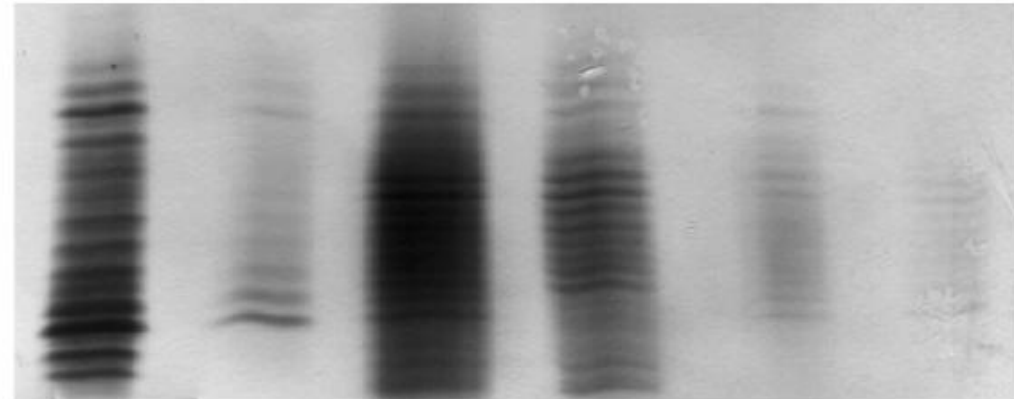
Oligoklonale Banden (OCB-IgG) – Erreger spezifisch

Beispiel :

ZNS Infektion durch
Varizella zoster Virus

VZV IEF-AMI

day 83 day 10 day 4
CSF se CSF se CSF se

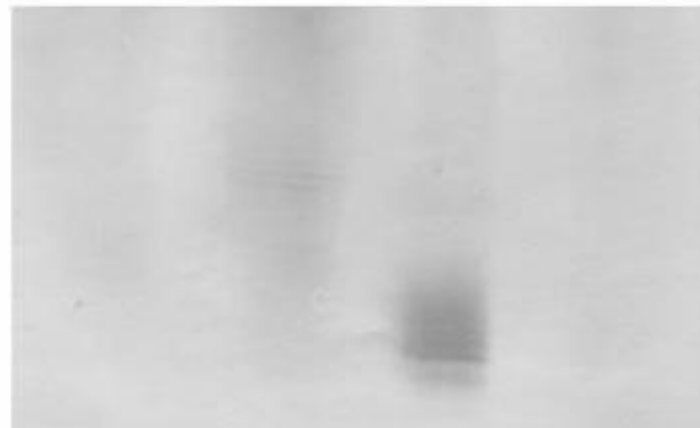


Prior absorption with
VZV-Antigen



VZV IEF-AMI

day 4 day 83
CSF se CSF se

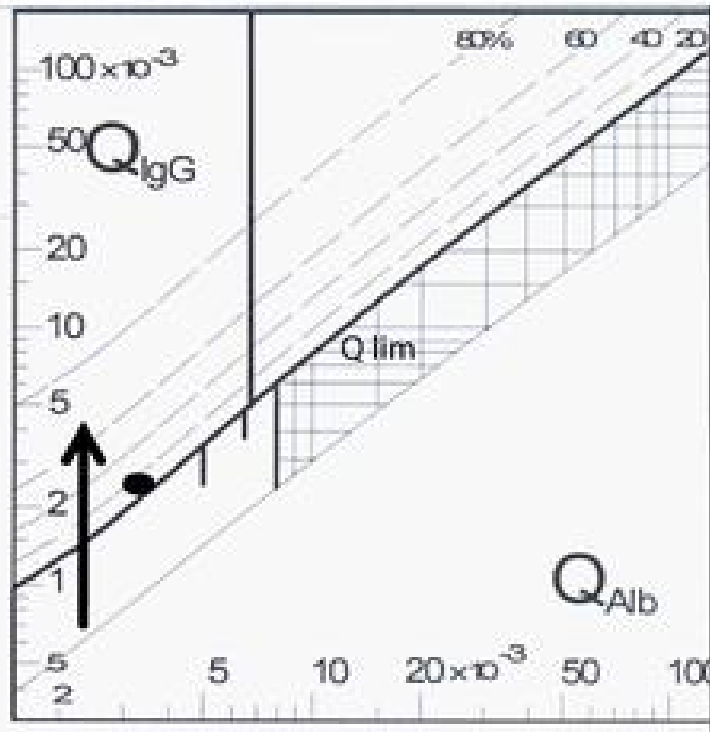


Disorder	Incidence of oligoclonal bands (%)
Multiple sclerosis	95
Autoimmune	
Neuro-SLE	50
Neuro-Bechet's	20
Neuro-sarcoid	40
Harada's meningitis-uveitis	60
Infectious	
Acute viral encephalitis (<7 days)	< 5
Acute bacterial meningitis (<7 days)	< 5
Subacute sclerosing panencephalitis	100
Progressive rubella panencephalitis	100
Neurosyphilis	95
Neuro-AIDS	80
Neuroborreliosis	80
Tumour	< 5
Hereditary	
Ataxia-telangiectasia	60
Adrenoleukodystrophy (encephalitic)	100

- OCB IgG → höchste Sensitivität als Einzel-Parameter für MS
- Unspezifisch

Deisenhammer_Guidelines on routine cerebrospinal fluid analysis_EJN_2006
 Brettschneider_IgG Abs against MRVZV Predict Conversion to MS in Clin Isol Syndrome_PLoS one 2009

Antikörper Index = AI

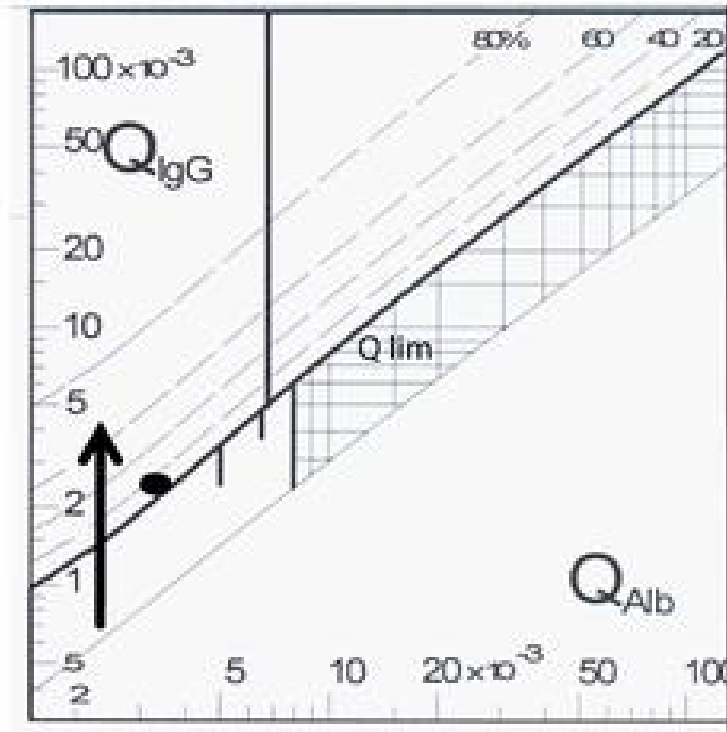


$$AI = \frac{Q \text{ IgG[spec]}}{Q \text{ IgG[total]}} = \frac{\text{IgG}_{\text{spec}}[\text{CSF}]}{\frac{\text{IgG}_{\text{total}}[\text{CSF}]}{\text{IgG}_{\text{total}}[\text{serum}]}}$$

$$\text{If } Q \text{ IgG} > Q \text{ lim: } AI = \frac{Q \text{ IgG[spec]}}{Q \text{ lim}}$$

- $AI \geq 1.5 = \text{positiv}$

Masern – Röteln – Zoster Reaktion



$$AI = \frac{Q_{IgG}[\text{spec}]}{Q_{IgG}[\text{total}]} = \frac{IgG_{\text{spec}}[\text{CSF}]}{IgG_{\text{total}}[\text{serum}]}$$

$$\text{If } Q_{IgG} > Q_{lim}: AI = \frac{Q_{IgG}[\text{spec}]}{Q_{lim}}$$

- $\geq 2 AI$ = MRZ Reaktion positiv

- Multiple Sklerose
- Neuromyelitis optica
- Paraneoplastische Neurologische Syndrome
- Acute Demyelinating Encephalo Myelitis
- Clinically Isolated Syndrom → MS

Kriterien von 2006

Alle „absoluten Kriterien“ sowie ≥ 2 „unterstützende Hauptkriterien“

absolute Kriterien

1. Optikusneuritis
2. akute Myelitis

unterstützende Hauptkriterien

1. spinale MRT: Signalveränderungen über ≥ 3 Rückenmarksegmente
2. kraniale MRT bei Erkrankungsbeginn: Paty-Kriterien der MS nicht erfüllt
3. positiver NMO-Antikörper-Nachweis

- Unterschiede
 - Pathogenese
 - klinisches Management
- MS
 - polyspezifische B Zelle Aktivierung
→ frühere Infekte mit neurotrophen Viren
- NMO
 - spezifische Serum AK (NMO-IgG)
 - auch pathogenetische Bedeutung

Table 1 Demographic and laboratory findings in 62 patients with neuromyelitis optica (NMO) and multiple sclerosis (MS)

	NMO	MS	p Value
No of patients	20	42	–
Age (years) (medium (range))	40 (19–72)	34.5 (18–62)	–
Sex (men:women)	1:3	1:3.2	–
Positive MRZ reaction	1/20 (5%)	37/42 (88%)	<0.0001*
AI M+R+Z+	0/20 (0%)	20/42 (48%)	<0.0001*
AI M+R+ or M+R+ or M+Z+	1/20 (5%)	17/42 (40%)	<0.001*
AI measles (AU) (median)	1.18	3.9	<0.0005†
AI rubella (AU) (median)	1.03	3.1	<0.0005†
AI zoster (AU) (median)	1.02	2.6	<0.0005†
OCBs	7/20 (35%)	39/42 (93%)	<0.0001*
CSF cell count >5/μl	14/20 (70%)	35/42 (83%)	NS*
Cells/μl (median (range))	7.5 (1–96)	11.5 (0–94)	NS†
QAib, elevated	10/20 (50%)	8/42 (19%)	<0.02*

+, positive antibody index; –, negative antibody index; AI, antibody indices; AU, arbitrary units; M, measles; OCB, CSF restricted oligoclonal bands; QAib, albumin CSF/serum ratio (age dependent upper reference range = 4+age/15 according to Reiber and colleagues¹³); R, rubella; Z, zoster.

*Fisher's exact test (two sided); †Mann Whitney U test (two tailed).

Heterogene Gruppe neurologischer Erkrankungen

TABLE 1. Paraneoplastic neurological syndromes

Classical syndromes	Nonclassical syndromes
Encephalomyelitis	Brainstem encephalitis
Limbic encephalitis	Optic neuritis
Subacute cerebellar degeneration	Cancer-associated retinopathy
Opsoclonus-myoclonus	Melanoma-associated retinopathy
Subacute sensory neuropathy	Stiff person syndrome
Lambert-Eaton myasthenic syndrome	Necrotizing myelopathy
	Motor neuron diseases
	Acute sensorimotor neuropathy
	Guillain-Barre syndrome
	Brachial neuritis
	Subacute/chronic sensorimotor neuropathies
	Neuropathy and paraproteinemia
	Neuropathy with vasculitis

- Ø infolge Metastasen oder CA-Therapie
- CA-Zellen exprimieren Proteine des Nervensystems
- Immun Antwort kreuzreagiert --> neurale Antigene
- Anti-neurale AK nicht pathogen
- T Zell-vermittelte Immunmechanismen pathogen ?

50-80% PNS vor manifestem Karzinom → frühe K.-Diagnose möglich

(1) Ausschluss andere neurologische Syndrome

(2) Suche Karzinom

(3) PNS Bestätigung : Klinik, Laborbefunde, Patient follow-up

TABLE 2. Paraneoplastic autoantibodies and associated cancers and syndromes

Autoantibody	Associated cancer	Paraneoplastic neurologic syndrome
Well-recognized antibodies		
Anti-Hu	Small cell lung cancer	Encephalomyelitis, paraneoplastic cerebellar degeneration, sensory neuronopathy
Anti-Yo	Gynecologic and breast cancer	Paraneoplastic cerebellar degeneration
Anti-Ri	Breast, gynecologic and small cell lung cancer	Paraneoplastic cerebellar degeneration, opsoclonus-myoclonus
Anti-Tr		Paraneoplastic cerebellar degeneration
Anti-CV2 or anti-CRMP5	Hodgkin lymphoma	Encephalomyelitis, paraneoplastic cerebellar degeneration, sensory neuronopathy
Anti-Ma proteins	Small cell lung cancer	Limbic encephalitis, paraneoplastic cerebellar degeneration
Anti-amphiphysin	Germ-cell tumors of testis, breast cancer	Stiff-man syndrome, encephalomyelitis
Partially recognized antibodies		
Antivoltage-gated calcium channel	Small cell lung cancer	Lambert-Eaton myasthenic syndrome, paraneoplastic cerebellar degeneration
Anti-acetylcholine receptor	Thymoma	Myasthenia gravis
Antivoltage-gated potassium channel	Thymoma	Limbic encephalitis

Paraneoplastische AK häufig negativ → kein Ausschluss PNS

MRZR häufiger positiv in MS Patienten (p <0.0001)

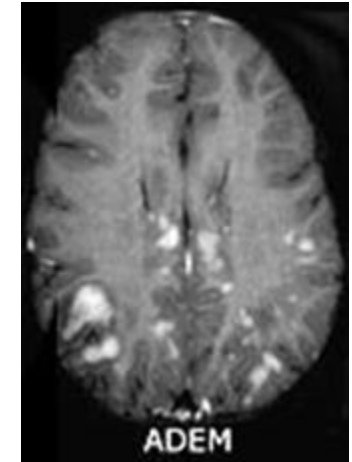
Frequency of intrathecal IgG production against neurotropic viruses.

Antibody indices	PND			MS			
AI M + R + Z +	0/34	0%	} 0%	20/42	48%	} 40%	} 88%
AI M + R +	0/34	0%		5/42	12%		
AI M + Z +	0/34	0%		5/42	12%		
AI R + Z +	0/34	0%		7/42	16%		
AI M +	1/34	3%		1/42	2%		
AI R +	2/34	6%		0/42	0%		
AI Z +	4/34	12%		0/42	0%		
AI M – R – Z –	27/34	79%		4/42	10%		

PND = Paraneoplastic neurological disorders, MS = multiple sclerosis, M = measles, R = rubella, Z = zoster virus, AI = antibody index, + = positive AI, – = negative AI.

Acute Demyelinating Encephalo Myelitis (ADEM)

- Autoimmunerkrankung post-infektiös/vakzinal
- Liquorbefund wie bei MS
- ADEM meist monophasisch, Ø dauerhafte immunmodulatorische Therapie
- MS frühe Behandlung → outcome ↑
- Unterscheidung ADEM < > MS möglichst früh
- MRZR positiv

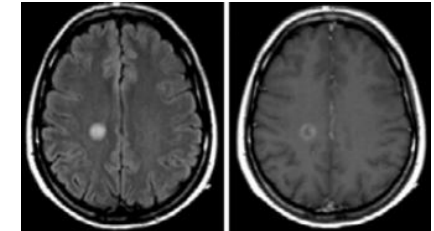


ADEM 1/12 < > MS 37/42 (p<0.001)

Clinically Isolated Syndrome (CIS)

Clinically Isolated Syndrome (CIS) → 60-80% → Multiple Sklerose

- Nervus opticus
- Hirnstamm
- Rückenmark



Type 1 CIS: clinically monofocal, at least one asymptomatic MRI lesion

Type 2 CIS: clinically multifocal, at least one asymptomatic MRI lesion

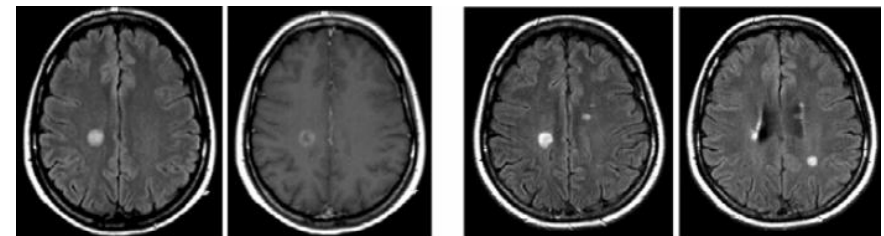
Type 3 CIS: clinically monofocal, MRI may appear normal; no asymptomatic MRI lesions

Type 4 CIS: clinically multifocal, MRI may appear normal; no asymptomatic MRI lesions

Type 5 CIS: no clinical presentation to suggest demyelinating disease, but MRI is suggestive

Definitive Diagnose

- Nachweis räumlicher/zeitlicher Dissemination der Krankheitsherde
- Ausschluss alternativer Diagnosen



(A) At initial presentation

(B) Three-month follow-up

2 Jahre follow-up :

CIS – CIS < > CIS – MS

Table 1. Demographic data, CSF and MRI findings in patients with clinically isolated syndrome (CIS).

		CIS all	CIS-CIS	CIS-RRMS	S*
n (female/male)		89 (56/33)	40 (22/18)	49 (34/15)	NS
Age [years]	Median (Range)	38.5 (13.1–70.9)	38.4 (16.8–70.9)	39.4 (13.1–63.6)	NS
EDSS	Median (Range)	2 (0–5)	2 (0–5)	3 (0–5)	NS
Measles AI ≥ 1.5	n (%)	37 (42)	11 (33)	26 (59)	NS
Rubella AI ≥ 1.5	n (%)	32 (36)	9 (24)	23 (49)	p = 0.03
Zoster AI ≥ 1.5	n (%)	32 (36)	12 (32)	20 (42)	NS
MRZR	n (%)	33 (37)	10 (25)	23 (47)	p = 0.04
MRZS	n (%)	19 (21)	4 (10)	15 (31)	p = 0.018
OCB	n (%)	74 (83)	27 (68)	47 (96)	p = 0.001
MRI	n (%)	59 (66)	21 (53)	38 (78)	p = 0.02
Barkhof criteria	n (%)	25 (28)	8 (20)	17 (35)	p = 0.125

CIS all = all patients with CIS, CIS-CIS = patients with CIS that remained CIS over follow-up, CIS-RRMS = CIS patients with conversion to MS over follow-up, EDSS = Kurtzke Expanded Disability Status Scale, AI = antibody index, MRZR = AI for measles, rubella, zoster, two or more AI ≥ 1.5, MRZS = MRZ score > 10, OCB = oligoclonal bands in cerebrospinal fluid, MRI = two or more lesions in T2-weighted magnetic resonance imaging of the brain. NS = not significant, S = statistical significance.

* CIS-CIS vs. CIS-RRMS

Table 2. Sensitivity, specificity, positive (PPV) and negative (NPV) predictive value in percent (exact 95% confidence interval in brackets) for CSF and MRI parameters regarding conversion of clinically isolated syndrome to definite multiple sclerosis.

	Sensitivity	Specificity	PPV	NPV
OCB	96 (86.0–99.5)	33 (18.6–49.1)	64 (51.5–74.4)	87 (59.5–98.3)
MRI	78 (63.4–88.2)	48 (31.5–63.9)	64 (50.9–76.5)	63 (43.9–80.0)
Barkhof criteria	35 (21.7–49.6)	80 (64.4–91.0)	68 (46.5–85.1)	50 (37.2–62.8)
MRZR	47 (32.5–61.7)	75 (58.8–87.3)	70 (51.3–84.4)	54 (39.7–67.0)
MRZS	31 (18.3–45.4)	90 (76.3–97.2)	79 (54.4–94.0)	51 (39.2–63.6)
OCB+MRI	73 (58.9–85.1)	60 (43.3–75.1)	69 (54.9–81.3)	65 (47.5–79.8)
OCB+Barkhof	33 (20.0–47.5)	83 (67.2–92.7)	70 (47.1–86.8)	50 (37.4–62.6)
OCB+MRZR	47 (32.5–61.7)	78 (61.6–89.2)	72 (53.3–86.3)	54 (40.7–67.6)
OCB+MRZS	31 (18.3–45.4)	90 (76.3–97.2)	79 (54.4–94.0)	51 (39.2–63.6)
MRI+MRZR	33 (20.0–47.5)	90 (76.3–97.2)	80 (56.3–94.3)	52 (39.8–64.4)
Barkhof+MRZR	14 (6.0–27.2)	95 (83.1–99.4)	78 (40.0–97.2)	48 (36.2–59.0)
MRI+MRZS	20 (10.2–34.3)	98 (86.8–99.9)	91 (58.7–99.8)	50 (38.5–61.5)
Barkhof+MRZS	10 (3.4–22.2)	98 (86.8–99.9)	83 (35.9–99.6)	47 (35.9–58.3)
OCB+MRI+MRZR	33 (20.0–47.5)	93 (79.6–98.4)	84 (60.4–96.6)	53 (40.6–64.9)
OCB+Barkhof+MRZR	14 (5.9–27.2)	98 (86.8–99.9)	88 (47.4–99.7)	48 (36.9–59.5)
OCB+MRI+MRZS	20 (10.2–34.3)	98 (86.8–99.9)	91 (58.7–99.8)	50 (38.5–61.5)
OCB+Barkhof+MRZS	10 (3.4–22.2)	98 (86.8–99.9)	83 (35.9–99.6)	47 (35.9–58.3)

MRZR = AI for measles, rubella, zoster, two or more AI ≥ 1.5 , MRZS = MRZ score > 10 , OCB = oligoclonal bands in cerebrospinal fluid, MRI = two or more lesions in T2-weighted magnetic resonance imaging of the brain.

- OCB
- MRZR
- OCB + MRZR + Barkhof Kriterien

Sensitivität

PPV

PPV ↑

Frequency of intrathecal antibodies (AI \geq 1.5) against measles (M)-, rubella (R)-, varicella zoster (V)- and herpes simplex (H)-virus in patient groups investigated

	Antibodies				
	M	R	Z	H	M–R–Z ^a
MS ^b	60/71	62/71	52/71	3/16	32/71
SSPE ^c	5/5	0/5	0/5	0/5	0/5
HSV-E ^d	0/4	0/4	4/4	4/4	0/4
CONTROL	0/28	0/28	0/28	0/28	0/28

^a Patients with intrathecal synthesis of antibodies against all three antigens M, R, Z.

^b MS — Multiple sclerosis.

^c SSPE — Subacute sclerosing panencephalitis.

^d HSV — Herpes simplex encephalitis.

Messung im Kammerwasser

TABLE 3. Frequencies of Intraocular Immune Reactions in the Aqueous Humor of Acute and Chronic Inflammations

Disease	Intraocular IgG		Increased Antibody Index (AI ≥ 1.5) [‡]				
	IF* [†]	Oligo [†]	M AI	R AI	VZV AI	HSV AI	Toxo AI
Fuchs heterochromic cyclitis (n = 52)	50% (25/51)	87% (34/39)	6% (3/48)	100% (52/52)	6% (3/44)	0% (0/36)	12% (2/16) [§]
Multiple sclerosis (n = 15)	87% (13/15)	100% (14/14)	80% (12/15)	73% (11/15)	47% (7/15)	23% (3/13)	—
Anterior uveitis (n = 27)	4% (1/27)	20% (2/10)	0% (0/27)	0% (0/27)	0% (0/27)	0% (0/27)	0% (0/21)
VZV iritis (n = 14)	7% (1/14)	62% (5/8)	0% (0/13)	0% (0/13)	100% (14/14)	46% (6/13)	0% (0/11)
HSV iritis (n = 25)	12% (3/25)	58% (7/12)	0% (0/23)	0% (0/23)	52% (13/25)	100% (25/25)	0% (0/17)
Toxoplasmosis retinitis (n = 24)	42% (10/24)	83% (10/12)	0% (0/20)	0% (0/20)	0% (0/22)	0% (0/21)	100% (24/24)
Senile cataract (n = 50)	0% (0/50)	0% (0/50)	0% (0/50)	0% (0/50)	0% (0/50)	0% (0/50)	0% (0/50)

*Intraocular IgG fraction, IgG_{IF} > 0.

[†]Oligoclonal IgG in aqueous humor.

[‡]Increased antibody index values (AI ≥ 1.5) for measles (M), rubella (R), varizella zoster (VZV), herpes simplex (HSV), and toxoplasma gondii (tox).

[§]Increased AI in two cases with AI = 1.8 and AI = 5.1; 6 cases with AI = 0.7–1.2; 8 cases not detectable. The patient with AI = 5.1 showed scars from former toxoplasmosis infection of the retina of both eyes.

^{||}Not analyzed in AH but increased toxo AI detected in CSF in 10% of the multiple sclerosis patients (8/80).

MRZR

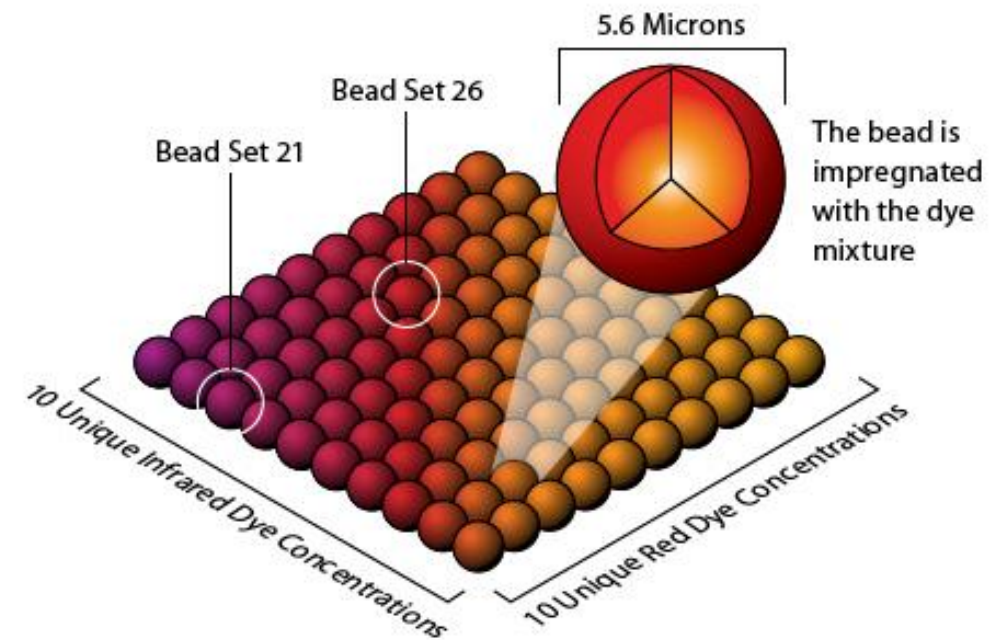
- als einzelner Labor Parameter → höchste Spezifität für MS
- Sensitivität MRZR < OCB für MS

	MS	CIS → MS	CIS - CIS	ADEM	NMO	PNS
MRZR positiv %	80-100	47	25	8	5	0

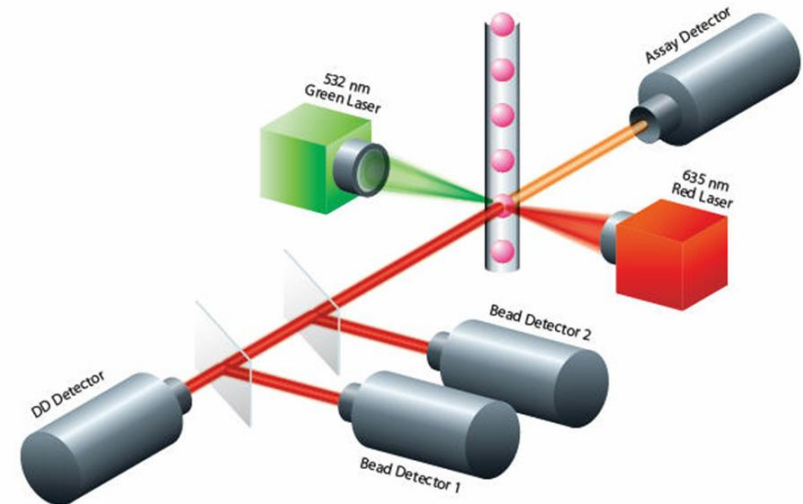
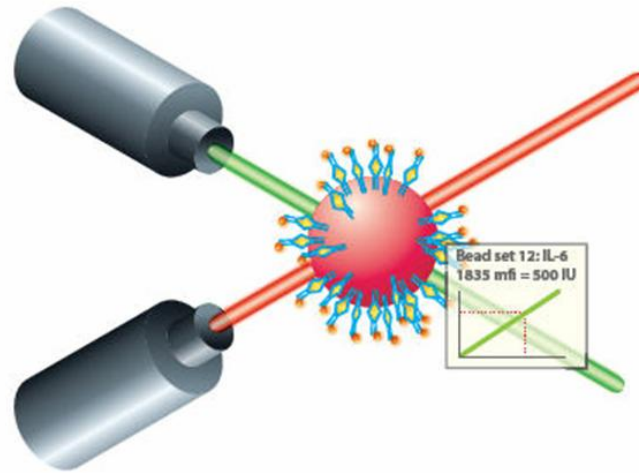
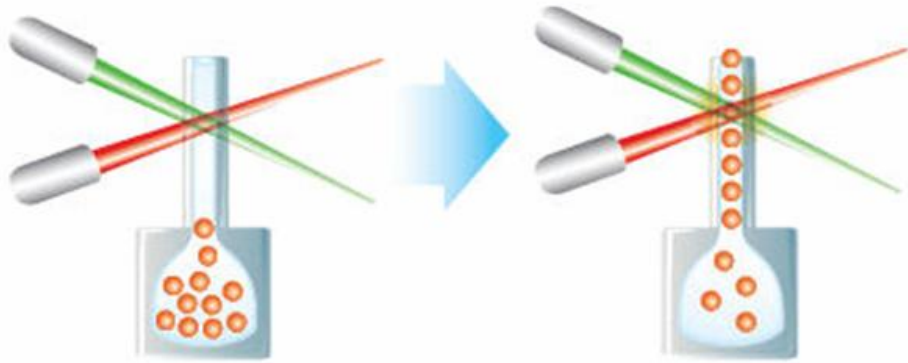


Luminex Flowzytometer

Polystyrol Kügelchen

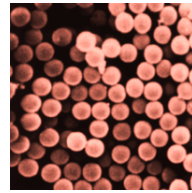


Luminex™ Technologie



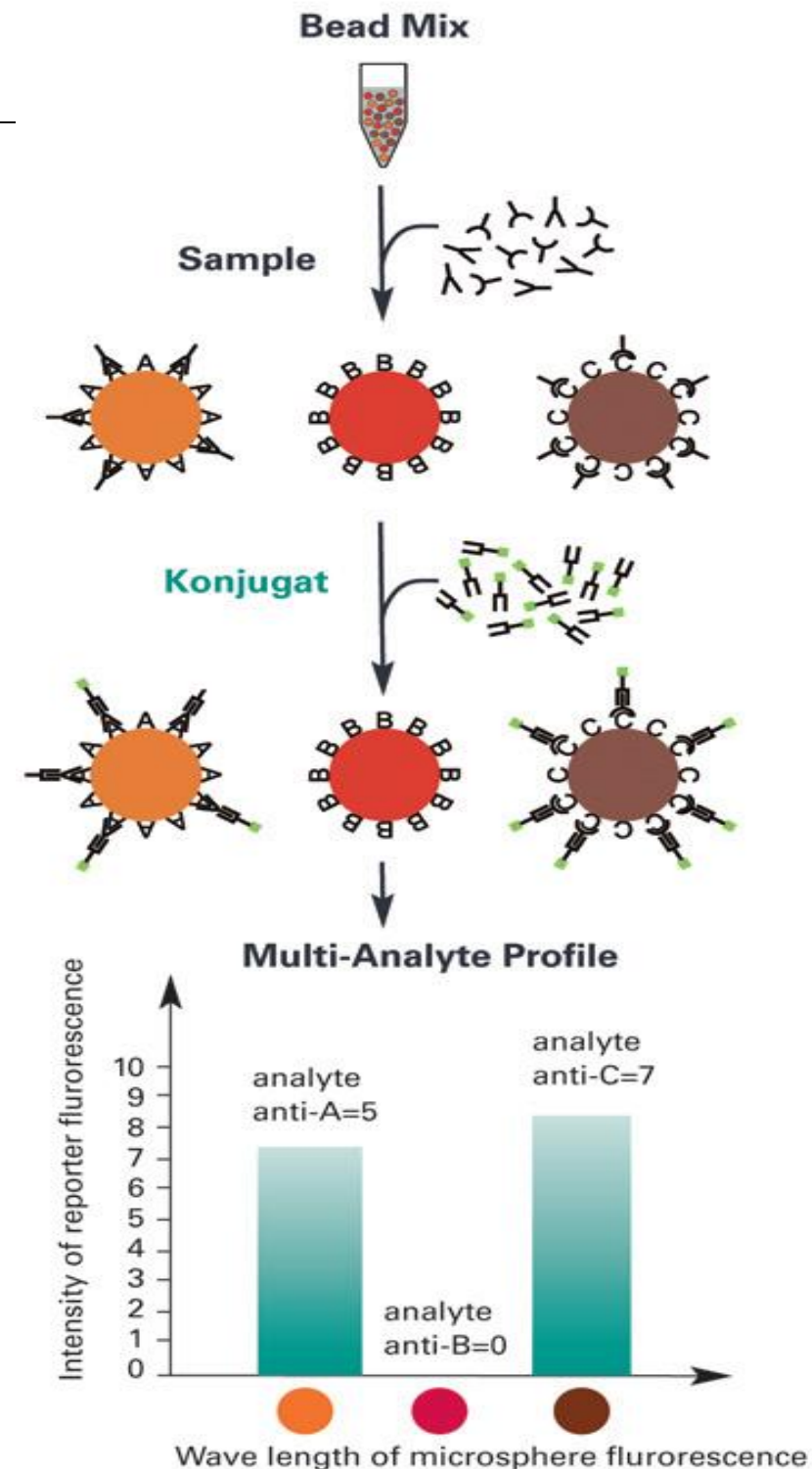
MRZH IgG Testablauf

Virus-Antigen beschichtete
Partikelpopulationen
→ parallel Analysen in einem
Testansatz
→ Identifizierung Virus Antigen



Fluoreszenzfarbstoff-markierte anti-
Human IgG Antikörper (Konjugat)
→ Menge Konjugat proportional AK-
Konzentration

Durchflusszytometer → Partikel
Grösse ?
Fluoreszenzintensität ?



Vorteile

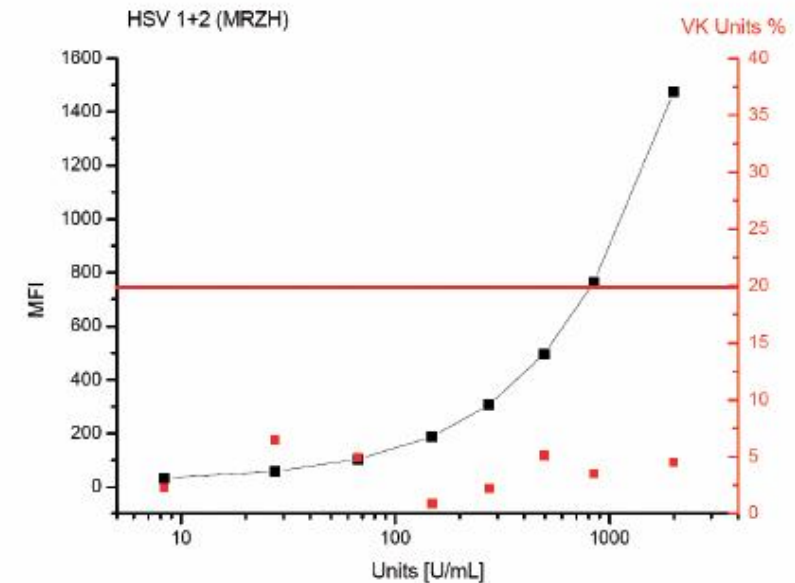
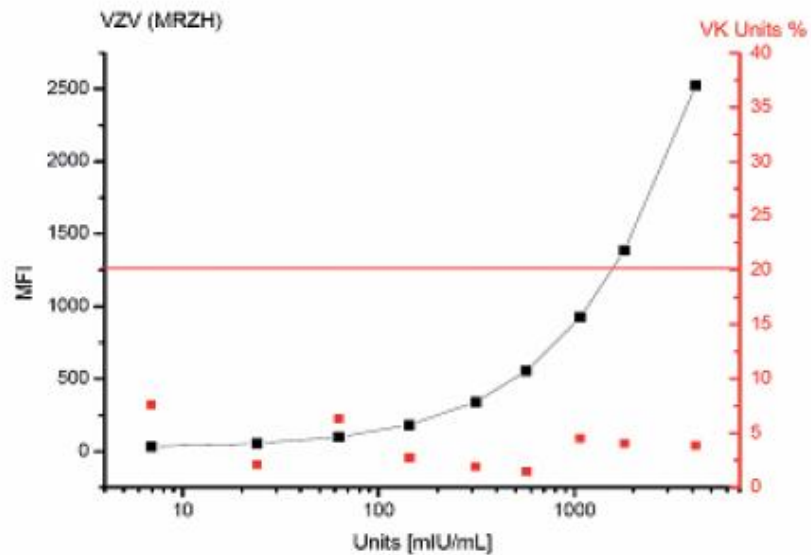
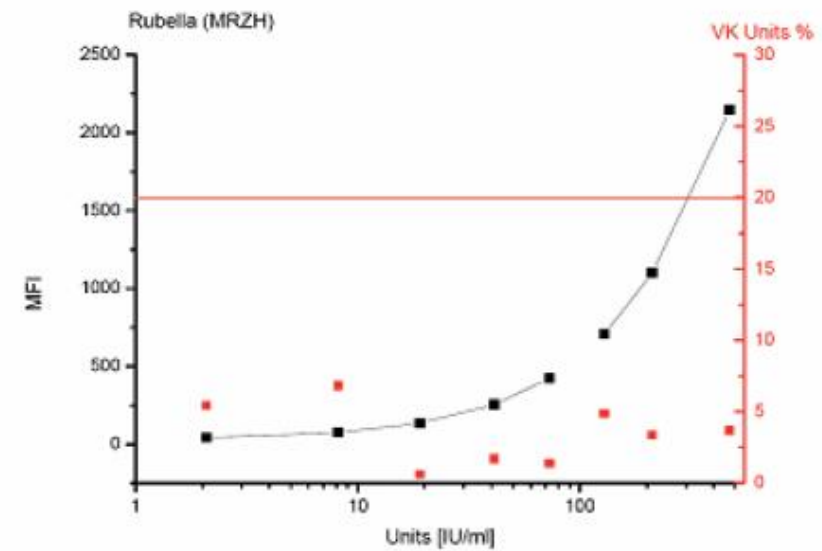
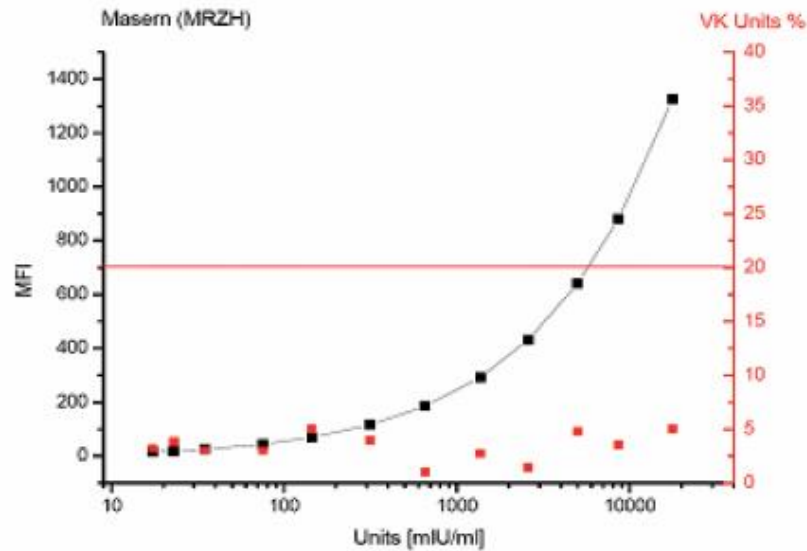
- Simultaner Ansatz von mehreren Analysen → Zeitersparnis
- Kleine Probenvolumina
- Hohe Sensitivität und Spezifität
- Vollautomatische Datenverarbeitung durch den Luminex® 100/200™



- AI von 0.7-1.3 normal
→ keine erregerspezifische Ak im Liquor
- AI >1.5 positives Resultat
→ erregerspezifische Ak im Liquor gebildet
- Bei idealer Messung Ergebnis: 1.0
- Bei Schrankenstörung kann Resultat ebenfalls 1.0 ergeben

IgG-oligoklonale Banden	[<2 OB]	3
Herp.-simp.-Virus 1+2 IgG qn (Se)	[<230 Titer]	11000
Herp.-simp.-Virus 1+2 IgM ql (Se)		neg.
MRZ Reaktion		pos.
Masernvirus IgG (Li/Se-Index n. Reiber)	[<=1.5]	5.00
Rötelnvirus IgG (Li/Se-Index n. Reiber)	[<=1.5]	7.10
Var.Zoster Virus (Li/Se-Index n.Reiber)	[<=1.5]	1.60
H. Simplex Virus (Li/Se-Index n.Reiber)	[<=1.5]	1.30

SERION MRZH IgG - Linearität + Präzision



SERION MRZ IgG - Sensitivität/Spezifität



	Sens %	Spez %	Ref
Masern Virus IgG	100	93.3	Siemens
Rubella Virus IgG	99,1	98,9	Siemens, Abbott, Roche
Varizella Zoster Virus IgG	100/87*	100/100*	FAMA

* latent infection / postvaccinal immunity

Danke für das Interesse