Autoantibodies in idiopathic inflammatory myopathies

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- Diagnostic marker with pathogenetic significance
- Diagnostic marker for indicated disease
- Colored circles indicate markers for primary screening
- Indicative autoantibody
- Occasionally associated autoantibodies with marker function for other diseases
- Autoantibodies, which may be found randomly associated but without disease specificity and without any diagnostic significance for the disease mentioned.

- Cited **literature** is marked with red numbers and linked with the authors given at the end of the document. By clicking the hand symbol (☞) one returns to the top of the table.
- **Autoantibodies** cited in the following tables are linked with their respective descriptions.
- The indicated values of **sensitivity** and **specificity** crucially depend on the respective test methods, on genetic and ethno-geographical variables and on the selection of tested patient and control populations, which is reflected by the considerable variations of the indicated data. Therefore the given figures may be regarded as an approximate guide for the selection of adequate tests for a given clinical situation. For this reason also qualitative estimates such as “low”, “medium” or “high” were used.

Autoantibodies in idiopathic inflammatory myopathies

Dermatomyositis (DM)

Autoantibodies	Sens [%]	Spec [%]	Disease associations
ANA- IIFT	50 - 80	low	multiple
Myositis specific antibodies (MSA) *7			
TIF1-γ *1	14 - 31	high *2	JDM, ADM, CaM 58
MDA5 (CADM-140)	11 - 35 *4	high *2	CADM, ILD, MCL 17, 45, 28, 32
NXP2 (MJ)	up to 30 *5	high *2	JDM, ADM, (CaM?) 28
SAE	up to 8 *6	high *2	ADM 64
Mi-2	5 - 30	> 95	**DM** (PM, IBM) 6, 33, 62, 64
Alanyl-tRNA synthetase (PL12)	up to 6	high *3	PM, DM, ILD 6, 25
Asparaginyl-tRNA synthetase (KS)	< 1	high *3	PM, DM, ILD 6
Glycyl-tRNA synthetase (EJ)	< 1	high *3	PM, DM, ILD 23a
Histidyl-tRNA synthetase (Jo-1)	9 - 20	> 95 *3	PM, DM, ILD, OM 6, 33, 25, 64
Isoleucyl-tRNA synthetase (OJ)	< 1	high *3	PM, DM, ILD 6
Phenylalanyl-tRNA synthetase (ZO)	unknown	unknown	PM, DM, ILD
Threonyl-tRNA synthetase (PL7)	< 3	high *3	PM, DM, ILD 6, 25
Tyrosyl-tRNA synthetase (Ha, YRS)	unknown	unknown	PM, DM, ILD
SRP	0 - 3	high *3	PM, DM, NAM 6, 33, 64

*1 The antibodies anti-TIF1-γ (150 kDa), -β (100 kDa), -α (140 kDa) exist in various combinations. By means of immunoprecipitation about 98,8 % of anti-TIF1 antibodies can be demonstrated with exception of solitary anti-TIF1- β (20). Anti-TINF1-γ has been demonstrated in 23 - 29 % of patients with juvenile dermatomyositis (22, 57), and in 13 - 30 % in the cases of adult dermatomyositis (22, 19, 57, 56). Carcinomas were present in about 50 - 75 % of the anti-TIF1 positive patients (20, 19).

*2 The antibodies are regarded as specific for DM.

*3 The figures of specificity refer to the idiopathic inflammatory myopathies on the whole (DM, PM, DM/PM-overlap).

*4 The figures given for prevalence refer particularly on studies in Asian patient populations. An American study revealing a prevalence of 13 % noted also pronounced cutaneous and mucocutaneous lesions ("dermato-pulmonary syndrome") (17).

*5 Anti-NXP2 are found in 19 - 29 % of patients with juvenile dermatomyositis, associated with pronounced muscle weakness, calcinosis, joint contractures, and muscle cell necrosis (14, 23, 28). Antibody prevalence in early adult dermatomyositis in USA and Europe was 17 - 30 % (17, 9) and 1,6 % in Japan (28) . In the adult form there were also found some associations with carcinomas and 8 % of the afflicted patients suffered from PM (9).

*6 Lower prevalence (< 2 %) in Japanese studies.

*7 According to Troyanov (59) the MSA and MAA, except anti-Mi-2, anti-SS-A/Ro, and anti-SS-B/La, have been classified as „*overlap*-antibodies" in the following three groups:

1. anti-synthetases: anti-Jo1, -OJ, -EJ, -KS, -PL7, -PL12.
2. antibodies associated with SSc: anti-centromeres, -Scl 70, -Th/To, -RNA-polymerases, -PM/Scl, -U1snRNP, -U2-snRNP, -U3-snRNP, -U5snRNP, -Ku.
3. other *overlap*-antibodies: anti-SRP, -nucleoporin.

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Autoantibodies in idiopathic inflammatory myopathies

Continuation

Dermatomyositis

Autoantibodies	Sens [%]	Spec [%]	Disease associations
Myositis specific antibodies (MSA) *7			
PMS1	8	unknown	DM, PM, aplA 8
PMS2	4	unknown	DM, PM 8
MLH1	4	unknown	DM, PM 8
DNA-PK_{CS}	2	unknown	DM, PM 8
Mas	1	unknown	DM, PM, AIH 6
Myositis associated antibodies (MAA) *7			
PM/Scl	up to 13	medium	DM, PM, OM 61, 48, 5, 6, 33
Ku	1	unknown	DM, PM, OM 6, 64
Fibrillarin	4	low	DM, PM, OM 33
U1-snRNP (U1-70K)	4	low	MCTD, SLE, SS 6, 33, 10, 64
SS-A/Ro 60	4	low	SLE, SS 6, 64
SS-A/Ro 52	22 - 24	low	SS, SLE 6, 33
SS-B/La	3 - 13	low	SS, SLE 6, 33
Other antibodies			
Histone (H1)	17	low	SLE 34
Argonaute 2 (Su)	4 - 9	low	PM, DM, SLE, MCDT,SS 53
Endothelial cell	36	low	multiple 12
Proteasome (20S; αC9)	62	low	DM, SLE 15
ADAM 10	casuistics	low	DM, ILD 21
50 kDa-Muscle membrane protein	15 - 20 *8	low	DM, PM, SSC , SLE, RA 54
Myo22/25	8	low	DM, PM 35
56 kDa-Kern-Protein	85 - 90	low	JDM, ADM, PM 2, 7, 13

*8 Elisa with rhabdomyosarcoma cells (TE671)

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Autoantibodies in idiopathic inflammatory myopathies

Polymyositis

Autoantibodies	Sens [%]	Spec [%]	Disease associations
Myositis specific antibodies (MSA) *[7]			
SRP	7	high *	PM, NAM, ASRPS (DM) 6, 33
Mi-2	0 - 9	high *	DM, PM, IBM 6, 33, 62
Alanyl-tRNA synthetase (PL12)	up to 8	high *	PM, DM, ILD 6, 25
Asparaginyl-tRNA synthetase (KS)	< 1	high *	PM, DM, ILD 6
Glycyl-tRNA synthetase (EJ)	< 1	high *	PM, DM, ILD
Histidyl-tRNA synthetase (Jo-1)	19 - 33	> 95 *	PM, DM, ILD 6, 33, 25
Isoleucyl-tRNA synthetase (OJ)	< 1	high *	PM, DM, ILD 6
Phenylalanyl-tRNA synthetase (ZO)	unknown	unknown	PM, DM, ILD
Threonyl-tRNA synthetase (PL7)	< 3	high *	PM, DM, ILD 6, 25
Tyrosyl-tRNA synthetase (Ha, YRS)	unknown	unknown	PM, DM, ILD
PMS1	8	unknown	DM, PM, aplA 8
PMS2	4	unknown	DM, PM 8
MLH1	4	unknown	DM, PM 8
DNA-PK_{CS}	2	unknown	DM, PM 8
Wa	casuistics	unknown	PM, ILD 30, 43
KJ	casuistics	unknown	PM, ILD 55
Mas	1	unknown	DM, PM, AIH 6
Myositis associated antibodies (MAA) (see Dermatomyositis)			
PM/Scl	up to 7	medium	DM, PM, OM 61, 48, 5, 6, 33
Other antibodies (see Dermatomyositis)			

* The figures of specificity refer to the idiopathic inflammatory myopathies on the whole (DM, PM, DM/PM-overlap).

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Autoantibodies in idiopathic inflammatory myopathies

Antisynthetase syndrome

Autoantibodies	Sens [%]	Spec [%]	Disease associations	
Histidyl-tRNA synthetase (Jo-1)	35,5	*	DM, PM, CADM, ILD	6, 33, 25
Glycyl-tRNA synthetase (EJ)	22,8	*	DM, PM, ILD, CADM	
Threonyl-tRNA synthetase (PL7)	17,5	*	DM, PM, ILD, CADM	6, 25
Alanyl-tRNA synthetase (PL12)	10,8	*	ILD, CADM, DM	6, 25
Asparaginyl-tRNA synthetase (KS)	7,8	*	ILD, CADM	6
Isoleucyl-tRNA synthetase (OJ)	4,5	*	ILD, PM, DM	6
Phenylalanyl-tRNA synthetase (ZO)	unknown	*	PM, DM, ILD	
Tyrosyl-tRNA synthetase (Ha, YRS)	unknown	*	PM, DM, ILD	
SS-A/Ro 52	18,6	*		
SS-B/La	2,4	*		
Centromeres	2,4	*		
U1-snRNP	1,2	*		
Scl-70	< 1	*		
Th/To	< 1	*		
U3-snRNP	< 1	*		
Sm	< 1	*		

* The antisynthetase syndrome is defined by the presence of an autoantibody reacting with one of the tRNA-synthetases listed above. Indications of specificities therefore become superfluous. Shown is the prevalence of the various specificities of anti-synthetase antibodies in patients suffering from an antisynthetase syndrome (23a).

Symptoms: acute onset, fever, interstitial lung disease (ILD, 80 %), "mechanic hands" (70 %), Raynaud syndrome (40 %), polyarthritis (60 %), sometimes also erosive. A clinically manifest myositis may be lacking (amyopathic course), especially in the early stage and in association with PL7 and PL12 (25). The various specificities of the anti-synthetases are linked to different courses of disease and to different clinical manifestations.

According to Troyanov (59) classified as "*overlap*-myositis".

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Autoantibodies in idiopathic inflammatory myopathies

Necrotizing autoimmune myopathy (NAM)

Autoantibodies	Sens [%]	Spec [%]	Disease associations	
SRP 54 kDa *1	3	high	PM, DM, NAM	6, 33
SRP 68 kDa	< 1	high	PM, DM, NAM	24
SRP 72 kDa	< 1	high	PM, DM, NAM	24
7 SL-RNA *2	unknown	unknown	DP, PM	52
HMG-CoA reductase *3	low	high	medication of statins	39, 40

*1 Anti-SRP may be associated with a rapidly progressive myopathy accompanied by muscle cell necrosis and scanty inflammatory infiltrations, sometimes with dermatomyositis like vascular lesions, showing decreased number of and enlarged capillaries and from time to time also complement deposits (**anti-SRP syndrome**). Rarely seen in children. Indicated frequencies refer on DM/PM. NAM may be associated with malignant tumors and virus infections (39)

According to Troyanov et al. (2005, 59) classified as "*overlap*-myositis".

*2 Anti-7SL-RNA were found mainly in Japanese patients positive for anti-SPP.

*3 Often associated with intake of statins. However, the majority of patients being on the medication of statins, also in cases of moderate incompatibility, do not develop antibodies against HMG-CoA reductase (63). Anti-HMG-CoA reductase is associated with DRB1*1101.

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Autoantibodies in idiopathic inflammatory myopathies

DM/PM-Overlap-syndrome

Autoantibodies	Sens [%]	Spec [%]	Disease associations
PM/Scl	15 - 36	high	OM 61, 48, 5, 6, 33, 16
Exosome *1	unknown	unknown	OM 5
Ku *2	4 - 25	medium	OM, DM, PM 13 , 33, 49, 18, 16
Fibrillarin	22	high	OM 33
U5-snRNP	casuistics	unknown	OM 36
Histidyl-tRNA synthetase (Jo-1)	10 - 20	high	PM, DM, OM, ILD 33, 64
Mi-2	0 - 5 *1	high	PM, DM 33, 64
SRP	3	high	PM, DM 33
Other antibodies *3			
ANA- IIFT	bis 60	low	multiple
Scl-70	30 - 38	high	SSC, OM 33
Centromeres	60 - 80	high	SSC, OM
RNA polymerase	22 - 30	high	SSC, OM
Th/To	up to 13	high	SSC, OM
U1-snRNP (U1-70K)	up to 21 *	low	MCTD, SLE, SS 6, 33, 10
U2-snRNP	up to 15 *	low	11, 42
SS-A/Ro 60	4 *	low	SLE, SS
SS-A/Ro 52	up to 37 *	low	SS, SLE 13, 6, 33
SS-B/La	up to 16 *	low	SS, SLE 6, 33
ds-DNA	< 2 *	95	SLE
CCP	14 *	> 90	RA

DM/PM *overlap* syndromes: most frequently there are overlaps of DM/PM and systemic sclerosis in 40 - 50 % of cases (59, 60), less frequently are overlaps with SLE, MCTD, RA or antisynthetase and anti-SRP syndrome.

*1 Mainly in anti-PM/Scl positive patients. Antibodies found were directed against hRp4p, hRp40p, hRp41p, hRp42p, hR46p, hCsl4p (5).

*2 The antibodies are found in association with systemic sclerosis, Sjögren's syndrome, systemic lupus erythematosus (49, 18). Muscle necrosis and interstitial lung disease in 75 % of cases, also cortisol resistant. Antibodies may also be seen without accompanying myositis in SLE, SSc, RA, SS. About 8 % of anti-Ku positive patients manifest an isolated myositis (38).

*3 The listed antibodies constitute markers of the diseases shown under the heading "associated diseases. They can be found with varying prevalence also in patients showing DM/P-overlap syndromes. The figures of sensitivity and specificity of these antibodies refer to the systemic sclerosis, the figures tagged by * refer to the DM/PM-overlap syndromes.

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Autoantibodies in idiopathic inflammatory myopathies

Cancer associated myositis

Autoantibodies	Sens [%]	Spec [%]	Disease associations
TIF1-γ *1	13 - 30	high	J**D**M, A**D**M, CaM
NXP2 (MJ) *2	up to 30	high	J**D**M, A**D**M (CaM?)

*1 In 50 - 75 % associated with malignant tumors. Antibodies are also frequently seen in juvenile DM (in these cases not associated with malignant tumors), rarely in polimyositis. Associated tumors were carcinomas of breast, lung, pancreas and colon in USA (1), such as nasopharyngeal , breast, lung and cervix carcinomas in Taiwan (27).

*2 Anti-NXP2 are found in 19 - 29 % of patients with juvenile dermatomyositis, associated with pronounced muscle weakness, calcinosis, joint contractures, and muscle cell necroses (14, 23, 28). Their prevalence in early adult dermatomyositis in USA and Europe was 17 - 30 % (17, 9), in Japan only 1.6 % (28). In the adult form there were also found some associations with carcinomas and 8 % of the afflicted patients suffered from PM (9).

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Autoantibodies in idiopathic inflammatory myopathies

Inclusion body myositis (IBM)

Autoantibodies	Sens [%]	Spec [%]	Disease associations	
Cytosolic 5'-Nukleosidase 1A (cN1A)	34	98	IBM	37, 47
Myositis specific antibodies (MSA)				
Histidyl-tRNA-Synthetase (Jo-1)	2 - 5 *1		PM, DM	6, 51
Alanyl-tRNA-Synthetase (PL12)	4 *1		PM, DM	51
SRP	0 - 3 *1		PM, DM	6, 51
Mi-2	2 - 8 *1		DM, PM	6, 51
Other antibodies				
PM/Scl	12 *1		OM	51
ANA-IIFT	29 *2		multiple	51
ds-DNA	2		SLE	51
Rheumatoide factors	casuistics *2		RA	31
Mitochondria (AMA)	casuistics *2		PBC	31
SS-A/Ro 52	16 - 25 *2		Kollagenosen	6, 51
SS-A/Ro 60	4 - 6		Kollagenosen	6, 51
SS-B/La	5 *2		Kollagenosen	6, 51
U1-snRNP	4 - 6		Kollagenosen	6, 51

*2 Also in association with overlap of Siögren's syndrome and IBM (31, 50)
*1 Not significant elevated in comparison with healthy controls (51)

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Autoantibodies in idiopathic inflammatory myopathies

Abbreviations	
Sens	Sensitivity
Spez	Specificity
Diseases	
ASRPS	Anti-SRP syndrome
ADM	Adult dermatomyositis
AIH	Autoimmune hepatitis
aplA	Aplastic anemia
CADM	Clinically amyopathic dermatomyositis
CaM	Cancer associated myositis
DM	Dermatomyositis
IBM	Inclusion body myositis
ILD	Interstitial lung disease
JDM	Juvenile dermatomyositis
NAM	Necrotizing autoimmune myopathy
MCL	Mucocutaneous lesions
MCTD	Mixed connective tissue disease
OM	Overlap-myositis
PBC	Primary biliary cirrhosis
PM	Polymyositis
RA	Rheumatoide Arthritis
SLE	Systemic lupus erythematosus
SS	Sjögren's syndrome
SSC	Systemic sclerosis

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Literature

1 Antiochos BB, Brown LA, Li Z, Tosteson TD, Wortmann RL, Rigby WF: Malignancy is associated with dermatomyositis but not polymyositis in Northern New England, USA. J Rheumatol (2009); 36(12): 2.704 - 2.710 (PMID: 19918034).

2 Arad-Dann H, Isenberg D, Ovadia E, Shoenfeld Y, Sperling J, Sperling R. Autoantibodies against a nuclear 56 kDa protein: a marker for inflammatory muscle disease. J Autoimmun (1989); 2(6): 877 - 888 (PMID: 2619871).

3 Belizna C, Henrion D, Beucher A, Lavigne C, Ghaali A, Lévesque H. Anti-Ku antibodies: Clinical, genetic and diagnostic insights. Autoimmun Rev (2010); 9(10): 691 - 694 (PMID: 20621654).

4 Betteridge Z, Gunawardena H, North J, Slinn J, McHugh N: Identification of a novel autoantibody directed against small ubiquitin-like modifier activating enzyme in dermatomyositis. Arthritis Rheum (2007); 56(9): 3.132 - 3.137 (PMID: 17763420).

5 Brouwer R, Vree Egberts WT, Hengstman GJ, Raijmakers R, van Engelen BG, Seelig HP, Renz M, Mierau R, Genth E, Pruijn GJ, van Venrooij WJ: Autoantibodies directed to novel components of the PM/Scl complex, the human exosome. Arthritis Res (2002); 4(2): 134 - 138 (PMID: 11879549).

6 Brouwer R, Hengstman GJ, Vree Egberts W, Ehrfeld H, Bozic B, Ghirardello A, Grøndal G, Hietarinta M, Isenberg D, Kalden JR, Lundberg I, Moutsopoulos H, Roux-Lombard P, Vencovsky J, Wikman A, Seelig HP, van Engelen BG, van Venrooij WJ: Autoantibody profiles in the sera of European patients with myositis. Ann Rheum Dis (2001); 60(2): 116 - 123(PMID: 11156543).

7 Cambridge G, Ovadia E, Isenberg DA, Dubowitz V, Sperling J, Sperling R: Juvenile dermatomyositis: serial studies of circulating autoantibodies to a 56kD nuclear protein. Clin Exp Rheumatol (1994); 12(4): 451 - 457 (PMID: 7955614).

8 Casciola-Rosen LA, Pluta AF, Plotz PH, Cox AE, Morris S, Wigley FM, Petri M, Gelber AC, Rosen A: The DNA mismatch repair enzyme PMS1 is a myositis-specific autoantigen. Arthritis Rheum (2001); 44(2): 389 - 396 (PMID: 11229471).

9 Ceribelli A, Fredi M, Taraborelli M, Cavazzana I, Franceschini F, Quinzanini M, Tincani A, Ross SJ, Chan JY, Pauley BA, Chan EK, Satoh M: Anti-MJ/NXP-2 autoantibody specificity in a cohort of adult Italian patients with polymyositis/dermatomyositis. Arthritis Res Ther (2012); 14(2): R97 (PMID: 22546500).

10 Coppo P, Clauvel JP, Bengoufa D, Oksenhendler E, Lacroix C, Lassoued K: Inflammatory myositis associated with anti-U1-small nuclear ribonucleoprotein antibodies: a subset of myositis associated with a favourable outcome. Rheumatology, Oxford (2002); 41(9): 1.040 - 1.046 (PMID: 12209039).

11 Craft J, Mimori T, Olsen TL, Hardin JA: The U2 small nuclear ribonucleoproteinparticle as an autoantigen. Analysis with sera from patients with overlapsyndromes. J Clin Invest (1988); 81(6): 1.716 - 1.724 (PMID: 2968364).

12 D'Cruz D, Keser G, Khamashta MA, Direskeneli H, Targoff IN, Miller F, Hughes GR: Antiendothelial cell antibodies in inflammatory myopathies: distribution among clinical and serologic groups and association with interstitial lung disease. J Rheumatol (2000); 27(1): 161 - 164 (PMID: 10648033.

13 Ehrenstein MR, Snaith ML, Isenberg DA. Idiopathic myositis: a rheumatological view. Ann Rheum Dis (1992); 51(1): 41 - 44 (PMID: 1540036).

Autoantibodies in idiopathic inflammatory myopathies

14 Espada G, Maldonado Cocco JA, Fertig N, Oddis CV: Clinical and serologic characterization of an Argentine pediatric myositis cohort: identification of a novel autoantibody (anti-MJ) to a 142-kDa protein. J Rheumatol (2009); 36(11): 2.547 - 2.451 (PMID: 19833756).

15 Feist E, Dörner T, Kuckelkorn U, Schmidtke G, Micheel B, Hiepe F, Burmester GR, Kloetzel PM: Proteasome alpha-type subunit C9 is a primary target of autoantibodies in sera of patients with myositis and systemic lupus erythematosus. J Exp Med (1996); 184(4): 1.313 - 1.218 (PMID: 8879203).

16 Fernandez C, Bardin N, De Paula AM, Salort-Campana E, Benyamine A, Franques J, Schleinitz N, Weiller PJ, Pouget J, Pellissier JF, Figarella-Branger D: Correlation of clinico-serologic and pathologic classifications of inflammatory myopathies: study of 178 cases and guidelines for diagnosis. Medicine (2013); 92(1): 15 - 24 (PMID: 23269233).

17 Fiorentino D, Chung L, Zwerner J, Rosen A, Casciola-Rosen L: The mucocutaneous and systemic phenotype of dermatomyositis patients with antibodies to MDA5 (CADM-140): a retrospective study. J Am Acad Dermatol (2011); 65(1): 25 - 34 (PMID: 21531040).

18 Franceschini F, Cavazzana I, Generali D, Quinzanini M, Viardi L, Ghirardello A, Doria A, Cattaneo R: Anti-Ku antibodies in connective tissue diseases: clinical and serological evaluation of 14 patients. J Rheumatol (2002); 29(7): 1.393 - 1.397 (PMID: 12136894).

19 Fujikawa K, Kawakami A, Kaji K, Fujimoto M, Kawashiri S, Iwamoto N, Aramaki T, Ichinose K, Tamai M, Kamachi M, Nakamura H, Ida H, Origuchi T, Ishimoto H, Mukae H, Kuwana M, Kohno S, Takehara K, Sato S, Eguchi K: Association of distinct clinical subsets with myositis-specific autoantibodies towards anti-155/140-kDa polypeptides, anti-140-kDa polypeptides, and anti-aminoacyl tRNA synthetases in Japanese patients with dermatomyositis: a single-centre, cross-sectional study. Scand J Rheumatol (2009) 3 8(4): 263 -267 (PubMed (PMID: 19444719).

20 Fujimoto M, Hamaguchi Y, Kaji K, Matsushita T, Ichimura Y, Kodera M, Ishiguro N, Ueda-Hayakawa I, Asano Y, Ogawa F, Fujikawa K, Miyagi T, Mabuchi E, Hirose K, Akimoto N, Hatta N, Tsutsui K, Higashi A, Igarashi A, Seishima M, Hasegawa M, Takehara K: Myositis-specific anti-155/140 autoantibodies target transcription intermediary factor 1 family proteins. Arthritis Rheum (2012); 64(2): 513 - 522 (PMID: 21987216).

21 Fujita J, Takeuchi T, Dobashi N, Ohtsuki Y, Tokuda M, Takahara J: Detection of anti-ADAM 10 antibody in serum of a patient with pulmonary fibrosis associated with dermatomyositis. Ann Rheum Dis (1999); 58(12): 770 - 772. (PMID: 10577965).

22 Gunawardena H, Wedderburn LR, North J, Betteridge Z, Dunphy J, Chinoy H, Davidson JE, Cooper RG, McHugh NJ: Clinical associations of autoantibodies to a p155/140 kDa doublet protein in juvenile dermatomyositis. Rheumatology, Oxford (2008); 47(3): 324 - 328 (PMID: 18238791).

23 Gunawardena H, Wedderburn LR, Chinoy H, Betteridge ZE, North J, Ollier WE, Cooper RG, Oddis CV, Ramanan AV, Davidson JE, McHugh NJ: Autoantibodies to a 140-kd protein in juvenile dermatomyositis are associated with calcinosis. Arthritis Rheum (2009); 60(6): 1.807 - 1.814 (PMID: 19479859).

23aHamaguchi Y, Fujimoto M, Matsushita T, Kaji K, Komura K, Hasegawa M, Kodera M, Muroi E, Fujikawa K, Seishima M, Yamada H, Yamada R, Sato S, Takehara K, Kuwana M: Common and distinct clinical features in adult patients with anti-aminoacyl-tRNA synthetase antibodies: heterogeneity within the syndrome. PLoS One (2013); 8(4): e60442 (PMID: 23573256).

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24 Henes JC, Heinzelmann F, Wacker A, Seelig HP, Klein R, Bornemann A, Faul C, Kanz L, Koetter I: Antisignal recognition particle-positive polymyositis successfully treated with myeloablative autologous stem cell transplantation. Ann Rheum Dis (2009); 68(3): 447 -448 (PMID: 19213752).

25 Hervier B, Devilliers H, Stanciu R, Meyer A, Uzunhan Y, Masseau A, Dubucquoi S, Hatron PY, Musset L, Wallaert B, Nunes H, Maisonobe T, Olsson NO, Adoue D, Arlet P, Sibilia J, Guiguet M, Lauque D, Amoura Z, Hachulla E, Hamidou M, Benveniste O: Hierarchical cluster and survival analyses of antisynthetase syndrome: phenotype and outcome are correlated with anti-tRNA synthetase antibody specificity. Autoimmun Rev (2012); 12(2): 210 - 217 (PMID: 22771754).

26 Hoogendijk JE, Amato AA, Lecky BR, Choy EH, Lundberg IE, Rose MR, Vencovsky J, de Visser M, Hughes RA: 119th ENMC international workshop: trial design in adult idiopathic inflammatory myopathies, with the exception of inclusion body myositis, 10-12 October 2003, Naarden, The Netherlands. Neuromuscul Disord (2004); 14(5): 337 - 345 (PMID: 15099594).

27 Huang YL, Chen YJ, Lin MW, Wu CY, Liu PC, Chen TJ, Chen YC, Jih JS, Chen CC, Lee DD, Chang YT, Wang WJ, Liu HN: Malignancies associated with dermatomyositis and polymyositis in Taiwan: a nationwide population-based study. Br J Dermatol (2009); 161(4): 854 - 860 (PMID: 19558555).

28 Ichimura Y, Matsushita T, Hamaguchi Y, Kaji K, Hasegawa M, Tanino Y, Inokoshi Y, Kawai K, Kanekura T, Habuchi M, Igarashi A, Sogame R, Hashimoto T, Koga T, Nishino A, Ishiguro N, Sugimoto N, Aoki R, Ando N, Abe T, Kanda T, Kuwana M, Takehara K, Fujimoto M: Anti-NXP2 autoantibodies in adult patients with idiopathic inflammatory myopathies: possible association with malignancy. Ann Rheum Dis (2012); 71(5): 710 - 713 (PMID: 22258483).

29 Kaji K, Fujimoto M, Hasegawa M, Kondo M, Saito Y, Komura K, Matsushita T, Orito H, Hamaguchi Y, Yanaba K, Itoh M, Asano Y, Seishima M, Ogawa F, Sato S, Takehara K: Identification of a novel autoantibody reactive with 155 and 140 kDa nuclear proteins in patients with dermatomyositis: an association with malignancy. Rheumatology, Oxford (2007; 46(1): 25 - 28 (PMID: 16728436).

30 Kajihara M, Kuwana M, Tokuda H, Yamane K, Kubo M, Hirakata M, Mimori T: Myositis and interstitial lung disease associated with autoantibody to a transferRNA-related protein Wa. J Rheumatol (2000); 27(11): 2.707 - 2.710 (PMID: 11093458).

31 Kanellopoulos P, Baltoyiannis C, Tzioufas AG: Primary Sjögren's syndrome associated with inclusion body myositis. Rheumatology, Oxford (2002); 41(4): 440 - 444 (PMID: 11961175).

32 Kang EH, Nakashima R, Mimori T, Kim J, Lee YJ, Lee EB, Song YW: Myositis autoantibodies in Korean patients with inflammatory myositis: anti-140-kDa polypeptide antibody is primarily associated with rapidly progressive interstitial lung disease independent of clinically amyopathic dermatomyositis. BMC Musculoskelet Disord (2010); 11:223 (PMID: 20875136).

33 Koenig M, Fritzler MJ, Targoff IN, Troyanov Y, Senécal JL: Heterogeneity of autoantibodies in 100 patients with autoimmune myositis: insights into clinical features and outcomes. Arthritis Res Ther. 2007;9(4):R78. PubMed PMID: 17688695).

Autoantibodies in idiopathic inflammatory myopathies

34 Kubo M, Ihn H, Yazawa N, Sato S, Kikuchi K, Tamaki K: Prevalence and antigen specificity of anti-histone antibodies in patients with polymyositis/dermatomyositis. J Invest Dermatol (1999); 112(5): 711 - 715 (PMID: 10233761).

35 Kubo M, Ihn H, Kuwana M, Yamane K, Yazawa N, Tamaki K: Prevalence in myositis of antibodies recognizing anti-U3 RNA probably in a novel complex with 22/25 kD protein and not fibrillarin. Clin Exp Immunol (2001); 126(2): 339 - 344 (PMID: 11703380).

36 Kubo M, Ihn H, Kuwana M, Asano Y, Tamaki T, Yamane K, Tamaki K: Anti-U5 snRNP antibody as a possible serological marker for scleroderma-polymyositis overlap. Rheumatology, Oxford (2002); 41(5): 531 - 534 (PMID: 12011376).

37 Larman HB, Salajegheh M, Nazareno R, Lam T, Sauld J, Steen H, Kong SW, Pinkus JL, Amato AA, Elledge SJ, Greenberg SA: Cytosolic 5'-nucleotidase 1A autoimmunity in sporadic inclusion body myositis. Ann Neurol (2013); 73(3): 408 - 418 (PMID: 23596012).

38 Lakota K, Thallinger GG, Sodin-Semrl S, Rozman B, Ambrozic A, Tomsic M, Praprotnik S, Cucnik S, Mrak-Poljsak K, Ceribelli A, Cavazzana I, Franceschini F, Vencovsky J, Czirják L, Varjú C, Steiner G, Aringer M, Stamenkovic B, Distler O, Matucci-Cerinic M, Kveder T: International cohort study of 73 anti-Ku-positive patients: association of p70/p80 anti-Ku antibodies with joint/bone features and differentiation of disease populations by using principal-components analysis. Arthritis Res Ther (2012); 14(1): R2 (PMID: 22226402).

39 Liang C, Needham M: Necrotizing autoimmune myopathy. Curr Opin Rheumatol (2011); 23(6): 612 - 619 (PMID: 21885975).

40 Mammen AL, Chung T, Christopher-Stine L, Rosen P, Rosen A, Doering KR, Casciola-Rosen LA: Autoantibodies against 3-hydroxy-3-methylglutaryl-coenzyme A reductase in patients with statin-associated autoimmune myopathy. Arthritis Rheum (2011); 63(3): 713 - 721 (PMID: 21360500).

41 Muro Y, Ishikawa A, Sugiura K, Akiyama M: Clinical features of anti-TIF1-α antibody-positive dermatomyositis patients are closely associated with coexistent dermatomyositis-specific autoantibodies and anti-TIF1-γ or anti-Mi-2 autoantibodies. Rheumatology, Oxford (2012); 51(8): 1.508 - 1.513 (PMID: 22539482).

42 Mimori T, Hinterberger M, Pettersson I, Steitz JA: Autoantibodies to the U2 small nuclear ribonucleoprotein in a patient with scleroderma-polymyositis overlap syndrome. J Biol Chem (1984); 259(1): 560 - 565 (PMID: 6231285).

43 Mita S, Adachi M, Tomii M, Matsuoka Y, Irimajiri S, Miyachi K, Takano S, Matsushima H, Hiwatashi T: Clinical study on two cases of progressive systemic sclerosis with anti Wa antibody. Ryumachi (1989); 29(5): 365 - 370 (PMID: 2634885).

44 Miyachi K, Takano S, Mimori T, Yamagata H, Mita S, Matsuoka Y, Irimajiri S, Tani K, Akizuki M, Homma M: A novel autoantibody reactive with a 48 kDa tRNA associated protein in patients with scleroderma. J Rheumatol (1991); 18(3): 373 -378 (PMID: 1906937).

45 Nakashima R, Imura Y, Kobayashi S, Yukawa N, Yoshifuji H, Nojima T, Kawabata D, Ohmura K, Usui T, Fujii T, Okawa K, Mimori T: The RIG-I-like receptor IFIH1/MDA5 is a dermatomyositis-specific autoantigen identified by the anti-CADM-140 antibody. Rheumatology, Oxford (2010); 49(3): 433 - 440 (PMID: 20015976).

46 Ng KP, Ramos F, Sultan SM, Isenberg DA: Concomitant diseases in a cohort of patients with idiopathic myositis during long-term follow-up. Clin Rheumatol (2009); 28(8): 947 - 953 (PMID: 19387765).

Autoantibodies in idiopathic inflammatory myopathies

47 Pluk H, van Hoeve BJ, van Dooren SH, Stammen-Vogelzangs J, van der Heijden A, Schelhaas HJ, Verbeek MM, Badrising UA, Arnardottir S, Gheorghe K, Lundberg IE, Boelens WC, van Engelen BG, Pruijn GJ: Autoantibodies to cytosolic 5'-nucleotidase 1A in inclusion body myositis. Ann Neurol (2013); 73(3): 397 - 407 (PMID: 23460448).

48 Raijmakers R, Renz M, Wiemann C, Egberts WV, Seelig HP, van Venrooij WJ, Pruijn GJ: PM-Scl-75 is the main autoantigen in patients with the polymyositis/scleroderma overlap syndrome. Arthritis Rheum (2004); 50(2): 565 - 569 (PMID: 14872500).

49 Rigolet A, Musset L, Dubourg O, Maisonobe T, Grenier P, Charuel JL, Behin A, Herson S, Amoura Z, Benveniste O: Inflammatory myopathies with anti-Ku antibodies: a prognosis dependent on associated lung disease. Medicine (2012); 91(2): 95 - 102 (PMID: 22391471).

50 Rojana-Udomsart A, Needham M, Luo YB, Fabian V, Walters S, Zilko PJ, Mastaglia FL: The association of sporadic inclusion body myositis and Sjögren's syndrome in carriers of HLA-DR3 and the 8.1 MHC ancestral haplotype. Clin Neurol Neurosurg (2011); 113(7): 559 - 563 (PMID: 21507567).

51 Rojana-Udomsart A, Bundell C, James I, Castley A, Martinez P, Christiansen F, Hollingsworth P, Mastaglia F: Frequency of autoantibodies and correlation with HLA-DRB1 genotype in sporadic inclusion body myositis (s-IBM): a population control study. J Neuroimmunol (2012); 249(1-2): 66 - 70 (PMID: 22554526).

52 Satoh T, Okano T, Matsui T, Watabe H, Ogasawara T, Kubo K, Kuwana M, Fertig N, Oddis CV, Kondo H, Akahoshi T: Novel autoantibodies against 7SL RNA in patients with polymyositis/dermatomyositis. J Rheumatol (2005); 32(9): 1.727 - 1.733 (PMID: 16142868).

53 Satoh M, Chan JY, Ceribelli A, Vazquez del-Mercado M, Chan EK: Autoantibodies to Argonaute 2 (Su antigen). Adv Exp Med Biol (2013); 768: 45 - 59 (PMID: 23224964).

54 Stuhlmüller B, Jerez R, Hausdorf G, Barthel HR, Meurer M, Genth E, Kalden JR, Burmester GR: Novel autoantibodies against muscle-cell membrane proteins in patients with myositis. Arthritis Rheum (1996); 39(11): 1.860 - 1.868 (PMID: 8912508).

55 Targoff IN, Arnett FC, Berman L, O'Brien C, Reichlin M. Anti-KJ: a newantibody associated with the syndrome of polymyositis and interstitial lung disease. J Clin Invest (1989) 84(1): 162 - 172(PMID: 2661587).

56 Targoff IN, Mamyrova G, Trieu EP, Perurena O, Koneru B, O'Hanlon TP, Miller FW, Rider LG: A novel autoantibody to a 155-kd protein is associated with dermatomyositis. Arthritis Rheum (2006); 54(11): 3.682 - 3.689 (PMID: 17075819).

57 Trallero-Araguás E, Labrador-Horrillo M, Selva-O'Callaghan A, Martínez MA, Martínez-Gómez X, Palou E, Rodriguez-Sanchez JL, Vilardell-Tarrés M: Cancer-associated myositis and anti-p155 autoantibody in a series of 85 patients with idiopathic inflammatory myopathy. Medicine (2010); 89(1): 47 - 52 (PMID: 20075704).

58 Trallero-Araguás E, Rodrigo-Pendás JÁ, Selva-O'Callaghan A, Martínez-Gómez X, Bosch X, Labrador-Horrillo M, Grau-Junyent JM, Vilardell-Tarrés M: Usefulness of anti-p155 autoantibody for diagnosing cancer-associated dermatomyositis: a systematic review and meta-analysis. Arthritis Rheum (2012); 64(2): 523 - 532 (PMID: 21953614).

59 Troyanov Y, Targoff IN, Tremblay JL, Goulet JR, Raymond Y, Senécal JL: Novel classification of idiopathic inflammatory myopathies based on overlap syndrome features and autoantibodies: analysis of 100 French Canadian patients. Medicine (2005); 84(4): 231 - 249 (PMID: 16010208).

Autoantibodies in idiopathic inflammatory myopathies

60 Váncsa A, Gergely L, Ponyi A, Lakos G, Németh J, Szodoray P, Dankó K: Myositis-specific and myositis-associated antibodies in overlap myositis in comparison to primary dermatopolymyositis: Relevance for clinical classification: retrospective study of 169 patients. Joint Bone Spine (2010); 77(2): 125 - 130 (PMID: 20188618).

61 Vandergheynst F, Ocmant A, Sordet C, Humbel RL, Goetz J, Roufosse F, Cogan E, Sibilia J: Anti-pm/scl antibodies in connective tissue disease: Clinical and biological assessment of 14 patients. Clin Exp Rheumatol (2006); 24(2): 129 - 133 (PMID: 16762146).

62 Zhang Y, LeRoy G, Seelig HP, Lane WS, Reinberg D: The dermatomyositis-specific autoantigen Mi2 is a component of a complex containing histone deacetylase and nucleosome remodeling activities. Cell (1998); 95(2): 279 - 289 (PMID: 9790534).

Hamaguchi Y, Fujimoto M, Matsushita T, Kaji K, Komura K, Hasegawa M, Kodera M, Muroi E, Fujikawa K, Seishima M, Yamada H, Yamada R, Sato S, Takehara K, Kuwana M: Common and distinct clinical features in adult patients with anti-aminoacyl-tRNA synthetase antibodies: heterogeneity within the syndrome. PLoS One (2013); 8(4):e60442 (PMID: 23573256).

Reviews

63 Casciola-Rosen L, Mammen AL: Myositis autoantibodies. Curr Opin Rheumatol (2012); 24(6): 602 - 608 (PMID: 22955022).

64 Ghirardello A, Bassi N, Palma L, Borella E, Domeneghetti M, Punzi L, Doria A: Autoantibodies in polymyositis and dermatomyositis. Curr Rheumatol Rep (2013); 15(6): 335 (PMID: 23591825).

65 Lazarou IN, Guerne PA: Classification, diagnosis, and management of idiopathic inflammatory myopathies. J Rheumatol (2013); 40(5): 550 - 564. Erratum in: J Rheumatol (2013); 40(7): 1.240 (PMID: 23504386).

66 Sibilia J, Chatelus E, Meyer A, Gottenberg JE, Sordet C, Goetz J: Comment faire le diagnostic et mieux comprendre les myopathies inflammatoires? L'utilité des auto-anticorps. Presse Med (2010); 39(10): 1.010 - 1.025 (PMID: 20655695).