Table S1: Sequence similarity between additional SARS-CoV-2 proteins and enteric self-antigens related to ADs

Human Protein (Autoimmune-related Disease) [1]	SARS-CoV-2 Protein	Human VS SARS-CoV-2	Ln	Identity %	Similarity %	Score[2]
Cytochrome P450 2D6 (AIH, CD)	ORF1ab polyprotein	AFLPFSAG AFLPFAMG	8	75	87.5	33
Myosin-11 (AIH)	ORF1ab polyprotein	ASSDKFVA AGSDKGVA	8	75	75	24
	ORF1ab polyprotein	LEEEEAAR LNLEEAAR	8	75	75	24
	ORF1ab polyprotein	PKGFMDGK PKGFCDLK	8	75	75	30
	ORF1ab polyprotein	KQKDKKLK KQDDKKIK	8	75	87.5	32
Dihydrolipoyllysine-residue acetyltransferase component of pyruvate dehydrogenase complex, mitochondrial (PBC)	ORF1ab polyprotein	LVPADNEK LVPGFNEK	8	75	75	28
Small nuclear ribonucleoprotein Sm D1 (PBC)	ORF1ab polyprotein	LPLDTLLVD LPTGTLLVD	9	77.8	77.8	32
Protein-glutamine gamma-glutamyltransferase 2 (CD)	ORF8 protein	QPQPFVVD QHQPYVVD	8	75	87.5	32
	ORF1ab polyprotein	PFPASTGY PFVVSTGY	8	75	75	33
	ORF1ab polyprotein	QPEEQPT QPLEQPT	7	85.7	85.7	31
	ORF1ab polyprotein	EQKTVEIP EQKIAEIP	8	75	75	30
	ORF1ab polyprotein	LLNLNLP LSNLNLP	7	85.7	85.7	29
	ORF10 protein	RNYEASVD RNYIAQVD	8	75	75	29
Matrin-3 (AIH)	ORF1ab polyprotein	FDSEYERMG FDSEYCRHG	9	77.8	77.8	33
	ORF1ab polyprotein	QKLKKFLN KKLKKSLN	8	75	87.5	28
	ORF1ab polyprotein	KVDKIEEL KAYKIEEL	8	75	75	25
	ORF1ab polyprotein	IATGGAVF IAFGGCVF	8	75	75	28
Formimidoyltransferase-cyclodeaminase (AIH)	ORF8 protein	VGARSAAP VGARKSAP	8	75	87.5	31
Lipoamide acyltransferase component of branched-chain alpha-keto acid	ORF1ab polyprotein	PPKPKDMT PGIPKDMT	8	75	75	30
	Spike glycoprotein	IDLTELVK	8	75	75	24

dehydrogenase complex, mitochondrial (AIH)		IDLQELGK				
E3 ubiquitin-protein ligase TRIM21 (AIH)	ORF1ab polyprotein	KLEVEIAI KLNEEIAI	8	75	75	24
	ORF1ab polyprotein	LDPDTANP LKVDTANP	8	75	75	29
	Spike glycoprotein	PRRQASSA PRRAASVA	8	75	75	26
	nucleocapsid phosphoprotein	QSGERSG QNGERSG	7	85.7	100	32
	ORF1ab polyprotein	GRSGETSG GRSGETLG	8	87.5	87.5	35
Protein disulfide-isomerase A3 (AIH)	ORF3a protein	LFPGVALL LIVGVALL	8	75	75	24
	Nucleocapsid phosphoprotein	EEKPKKKKKA EPKKDKKKKA	10	70	70	31
Dihydrolipoyllysine-residue succinyltransferase component of 2-oxoglutarate dehydrogenase complex, mitochondrial (AIH)	Spike glycoprotein	IDDTTKEV IDDTTDAV	8	75	75	28
Smoothelin (AIH)	ORF1ab polyprotein	AIRRVRA AIRHVRA	7	85.7	85.7	26
	ORF1ab polyprotein	EKLEKEGA ENLTKEGA	8	75	75	28
O-phosphoseryl-tRNA(Sec) selenium transferase (AIH,PBC)	ORF1ab polyprotein	TDLKAVEA TTLKGVEA	8	75	75	26
	ORF1ab polyprotein	GDELRTD GDELGTD	7	85.7	85.7	30
Nuclear pore membrane glycoprotein 210 (PBC)	Spike glycoprotein	FHAHSSVLN FGAISSVLN	9	77.8	77.8	27
	ORF3a protein	AASPIITL SASKIITL	8	75	87.5	25
	nucleocapsid phosphoprotein	KGFLASGS KGFYAEGS	8	75	75	30
	ORF1ab polyprotein	LATVLTSL LLTILTSL	8	75	87.5	28
	ORF1ab polyprotein	LVAVPLG LVAVPTG	7	85.7	85.7	28
	ORF1ab polyprotein	DESGQKKL DESGEFKL	8	75	87.5	29
Cytoskeleton-associated protein 5 (IBD)	ORF1ab polyprotein	LVKALKKV LAKALRKV	8	75	87.5	28
	ORF1ab polyprotein	VLGDSKNN VTGDSCNN	8	75	75	28
	ORF1ab	KAVNPFLA	8	75	75	27

	polyprotein	KLVNKFLA				
Noggin (UC)	ORF1ab	DLNETLL	7	85.7	100	31
	polyprotein	DLNETLV				
Sucrase-isomaltase, intestinal (Crohn's disease)	Spike glycoprotein	PNKRSFI	7	85.7	100	32
		PSKRSFI				
	ORF1ab polyprotein	LAFQTVK	7	85.7	100	30
		VAFQTVK				
	ORF1ab polyprotein	TSIGPLV	7	85.7	85.7	30
		TSFGPLV				
	ORF1ab polyprotein	YVIILDPA	8	75	75	27
		YVYIGDPA				

[1]Human proteins that are implicated in enteric autoimmune diseases: autoimmune hepatitis (AIH), celiac disease (CD), primary biliary cholangitis (PBC), ulcerative colitis (UC), and inflammatory bowel disease (IBD).

[2]**Score** is based on BLOSUM62 substitution matrix between amino acids.

Table S2: The functionality of additional enteric antigens and their corresponding similar sequences

Shared Peptides	Enteric protein and potential function/pathogenesis	AD[1]	Ref
AFLPFSAG	**Cytochrome P450 2D6 (CYP2D6, UniProt:P10635)** Has been recognized as the major autoantigen in type 2 AIH. In patients with AIH-2, the target for anti-LKM-1 antibodies has been identified as the 2D6 isoform of the large cytochrome P450 enzyme family.		[62–65]
ASSDKFVA LEEEEAAR PKGFMDGK KQKDKKLK	**Myosin-11 (SMMHC, UniProt:P35749)** Autoantibodies to non-muscle myosin heavy chain were reported in patients with chronic liver diseases. Patients presenting with ANA and/or smooth muscle antibodies (SMA), account for about 80% of cases of AIH.	AIH	[68,69]
LVPADNEK	**Dihydrolipoyllysine-residue acetyltransferase component of pyruvate dehydrogenase complex, mitochondrial (PDC-E2, UniProt:P10515)** PBC patients have been characterized to have autoreactive T-cell and B-cell responses directed at self-PDC-E2. The diagnosis of PBC is readily reached by the detection of specific AMA directed against PDH-E2.	PBC	[73,74]
LPLDTLLVD	**Small nuclear ribonucleoprotein SmD1 (SmD1, UniProt:P62314)** This protein autoantigen falls into the classical autoantibody categories of autoimmune liver diseases: ANA (anti-nuclear autoantibodies), SMA (anti-smooth muscle autoantibodies), AMA, and LKM (liver-kidney microsomal autoantigens).**.**	AIH PBC	[148]
QPQPFVVD PFPASTGY QPEEQPT EQKTVEIP LLNLNLP RNYEASVD	**Protein-glutamine gamma-glutamyltransferase 2 (TG2, UniProt:P21980)** TG2 is a ubiquitous enzyme that physiologically exerts multiple functions, mostly linked to matrix assembly and tissue repair. It is considered as the autoantigen in CD and the anti-TG2 autoantibodies are the prime serological marker of CD.	CD	[25,149]
FDSEYERMG QKLKKFLN KVDKIEEL IATGGAVF	**Matrin-3 (UniProt: P43243)** A major protein that makes up the fibrogranular network of the nuclear matrix. Used as a diagnostic and prognostic marker in hepatic tumor progression.	AIH	[150]
VGARSAAP	**Formimidoyltransferase-cyclodeaminase (FTCD, UniProt:O95954)** This enzyme is a liver-specific antigen recognized by the sera of patients with autoimmune hepatitis**.**	AIH	[151]
PPKPKDMT IDLTELVK	**Lipoamide acyltransferase component of branched-chain alpha-keto acid dehydrogenase complex, mitochondrial (BCOADC-E2, UniProt:P11182)** A 52 kDa mitochondrial autoantigen has been identified as the E2 subunit of the 2-oxo-acid dehydrogenase complex in PBC diagnosis.	PBC	[74,152]
KLEVEIAI LDPDTANP PRRQASSA QSGERSG GRSGETSG	**E3 ubiquitin-protein ligase TRIM21 (52 kDa Ro, UniProt:P19474)** Patients with AIH frequently express autoantibodies against soluble liver antigen/liver pancreas (anti-SLA/LP) and/or against 52 kDa Ro protein (anti-Ro52).	AIH	[153–155]
LFPGVALL EEKPKKKKKA	**Protein disulfide-isomerase A3 (ERp57, UniProt:P30101)** Antibodies against epitopes of ERp57were detected in Liver kidney microsomal antibody type 1 positive sera in AIH patients.	AIH	[156]
IDDTTKEV	**Dihydrolipoyllysine-residue succinyltransferase component of 2-oxoglutarate dehydrogenase complex, mitochondrial (OGDC-E2, UniProt: P36957)** Associated with several ADs	AIH PBC	[152,157,158]
AIRRVRA EKLEKEGA	**Smoothelin (UniProt:P53814)** A structural protein that is found exclusively in contractile smooth muscle cells. Part of the anti-smooth muscle antibodies in AIH.	AIH	[150,159]

TDLKAVEA GDELRTD	**O-phosphoseryl-tRNA(Sec) selenium transferase (SLA, UniProt:Q9HD40)** Anti-SLA autoantibodies test is a diagnostic marker for HIA in patients who are negative for other autoantibodies and may otherwise be misdiagnosed. In AIH, the presence of anti-SLA autoantibodies is associated with reduced overall survival.	**AIH PBC**	[160,161]
FHAHSSVLN AASPIITL KGFLASGS LATVLTSL LVAVPLG DESGQKKL	**Nuclear pore membrane glycoprotein 210 (gp210, UniProt:Q8TEM1)** Anti-nuclear envelope-gp210 antibodies are specifically detected in 20-30% of PBC patients; the presence of anti-gp210 antibodies predicts a more severe disease course.	**PBC**	[162,163]
LVKALKKV VLGDSKNN KAVNPFLA	**Cytoskeleton-associated protein 5 (Ch-TOG, UniProt:Q14008)** Involved in cell division, and tight junctional functional integrity. Suggested to have a role in IBD pathogenesis and colorectal cancer spreading in Crohn's disease.	**IBD**	[137,164]
DLNETLL	**Noggin (NOG, UniProt:Q13253)** Essential for cartilage morphogenesis and joint formation. Involved in the arthropathy in Crohn's disease.	**IBD**	[165]
PNKRSFI LAFQTVK TSIGPLV YVIILDPA	**Sucrase-isomaltase, intestinal (SI, UniProt:P14410)** A marked specific decrease in sucrase-isomaltase gene expression in villous enterocytes in acutely inflamed Crohn's ileum as compared to adjacent uninflamed ileum and normal ileum was reported.	**IBD**	[166]

[1] Autoimmune diseases: autoimmune hepatitis (AIH), celiac disease (CD), primary biliary cholangitis (PBC), and inflammatory bowel disease (IBD - including ulcerative colitis and Crohn's disease).

Table S3: Additional similar epitopes' sequence with immunoreactive validation in experimental assays in IEDB

Human Epitope	SARS-CoV-2 Epitope	Human vs SARS-CoV-2	IEDB Human Assays' References	IEDB SARS-CoV-2 Assays' References
GHFVKPEAFLPFSAGRRACL	LYENAFLPFAMG	AFLPFSAG / AFLPFAMG	Tcell [76]	Bcell(IgM) [82]
NASSDKFVADL	HFGAGSDKGVAPGTA	ASSDKFVA / AGSDKGVA	HLA-I [93]; HLA-II [90]	Bcell(IgM) [82]
DLEEQLEEEEAARQKLQLEKVT	THGLNLEEAARYMRS	LEEEEAAR / LNLEEAAR	HLA-II [93]	Bcell(IgM) [82]
NAIPKGFMDGKQA	IDHPNPKGFCDLKGK	PKGFMDGK / PKGFCDLK	HLA-II [93]	Bcell(IgA) [78]
SLKQKDKKLKE	RKQDDKKIKACV	KQKDKKLK / KQDDKKIK	HLA-II [93]	Bcell(IgM) [82]
ILAIGASEDKLVPADNEKGFDVA	LVPGFNEKTHVQLSL	LVPADNEK / LVPGFNEK	HLA-II [93]	Bcell(IgA) [78]
FILPDSLPLDTLLVDVEPK	RQWLPTGTLLVDSDL	LPLDTLLVD / LPTGTLLVD	HLA-I; HLA-II [167]	Bcell(IgA) [78]
EQPQPFVVDWIQ	TQHQPYVVDDPCPIH	QPQPFVVD / QHQPYVVD	Bcell(IgA) [168]	DRB1*15:01;Tcell [77]; Bcell(IgG) [169]
QPEPFPASTGYQ	DGVPFVVSTGYHFRE	PFPASTGY / PFVVSTGY	Bcell(IgA) [168]	Bcell(IgA) [78]
QPEEQPTVSYNG	DLQPLEQPTSEA	QPEEQPT / QPLEQPT	Bcell(IgA) [168]	Bcell(IgM) [82]
TEEQKTVEIP	VEQKIAEIPKEE	EQKTVEIP / EQKIAEIP	HLA-I [97]; DQA1*02:01/ DQB1*02:02 [170]	Bcell(IgM) [82]
PEQLLNLNLPEQ	FDTRVLSNLNLPGCD	LLNLNLP / LSNLNLP	Bcell(IgA) [168]	Bcell(IgM) [82]
LTLHFEGRNYEASVD	MNSRNYIAQVDV	RNYEASVD / RNYIAQVD	Bcell(IgA) [171]	Bcell(IgM) [82]
HKFDSEYERMG	TFDSEYCRHGTCER	FDSEYERMG / FDSEYCRHG	HLA-I [83]; DRB1*04:05 [93]	Bcell(IgM) [82]
SLPHYQKLKKFLNKLAEERRQ	EVVLKKLKKSLNVAK	QKLKKFLN / KKLKKSLN	HLA-II [93]	Bcell(IgM) [82]
KLKKVDKIEEL	SDKAYKIEELFYSYA	KVDKIEEL	A*02:02 [79];	Bcell(IgA) [78]

		KAYKIEEL	HLA-II [172]	
AIATGGAVF	**IAFGGCVF**SYVGCHN	IATGGAVF / IAFGGCVF	C*12:02 [173]; DQA1*05:05/DQB1*03:01 [170]; A*01:01 [174]; A*02:01 [175]; B*15:02 [96]; DQ [99]	Bcell(IgA) [78]
RAFVGE**VGARSAAP**GGGSV	YIR**VGARKSAP**LIEL	VGARSAAP / VGARKSAP	HLA-II [176]	Tcell [94]; Bcell(IgG) [169]
VEIMPP**PPKPKDMT**VPILV	CVDI**PGIPKDMT**YRR	PPKPKDMT / PGIPKDMT	HLA-II [90]	Bcell(IgA) [78]
IDLTELVKLREELKPIAF	NLNESL**IDLQELGK**YE	IDLTELVK / IDLQELGK	HLA-II [93]	A*11:01 [91]
ELAE**KLEVEIAI**KRADWK	**KLNEEIAI**I	KLEVEIAI / KLNEEIAI	Bcell(IgG) [153]	A*02:01 [177]; Tcell [96]; Bcell(IgA) [78]
TL**DPDTANP**WLILSE	**LKVDTANP**KTPKYKF	LDPDTANP / LKVDTANP	Bcell(IgG) [178]	Bcell(IgA) [78]; Tcell [94]
GI**PRRQASSA**VR	S**PRRAASVA**SQ	PRRQASSA / PRRAASVA	Bcell(IgG) [179]; HLA-II [93]	HLA-II [95]
G**QSGERSG**RSGS	SN**QNGERSG**ARSKQR	QSGERSG / QNGERSG	Bcell(IgG) [179]	Tcell [88]; Bcell(IgA) [78]
AR**GRSGETSG**HS	GIQY**GRSGETLG**VLV	GRSGETSG / GRSGETLG	Bcell(IgG) [179]; HLA-I [79]	Bcell(IgA) [78]
ALFPGVALL	ASLPFGW**LIVGVALL**	LFPGVALL / LIVGVALL	A*02:01 [180]; B*27:05 [181]; HLA-I [182]	Bcell(IgA) [78]; HLA [183]
NPPVIQ**EEKPKKKKKA**QE	**TEPKKDKKKKA**DETQ	EEKPKKKKKA / EPKKDKKKKA	DR [184]; DRB5*01:01 [185]; HLA-II [93]	Tcell [88]; Bcell(IgG) [85]
VIDDTTKEV	**RDIDDTTDAV**	IDDTTKEV / IDDTTDAV	HLA-I [186]	A*02:01 [187]
ERKLIRA**AIRRVRA**QE	NMFITREE**AIRHVRA**	AIRRVRA / AIRHVRA	HLA-II [167]	Tcell [94]; Bcell(IgA) [78]
EKLEKEGAAGSPGGPR	EFCGT**ENLTKEGA**TT	EKLEKEGA	DRB1*04:01	Bcell(IgA) [78]

Peptide 1	Peptide 2	Epitope	HLA	Immune response
		ENLTKEGA	[170]; HLA-II [93]	
ELR**TDLKAVEA**KVQELGPDC	**TTLKGVEA**VMYMGTL	TDLKAVEA / TTLKGVEA	Tcell [161]	Bcell(IgA) [78]
IENVLE**GDELRTD**LKAVEAK	**LGDELGTD**PYEDFQ	GDELRTD / GDELGTD	Tcell [161]	Bcell(IgM) [82]
V**FHAHSSVLN**F	QLSSN**FGAISSVLN**D	FHAHSSVLN / FGAISSVLN	HLA-I [188]; DQ [99]	HLA [95]; Tcell [189]; Bcell(IgA) [78]
AASPIITLV	**SASKIITL**K	AASPIITL / SASKIITL	HLA-I [188]; C*12:02 [173]	A*11:01 [190]; Tcell [191]; Bcell(IgM) [192]
HVDE**KGFLASGS**MIGT	QGTTLP**KGFYAEGS**R	KGFLASGS / KGFYAEGS	HLA-II [176]	Bcell(IgM) [89]
LATVLTSL	**LLLTILTSL**	LATVLTSL / LLTILTSL	B*51:01 [193]	A*02:01 [177]
AL**VAVPLG**MTV	FSTGVN**LVAVPTG**YV	LVAVPLG / LVAVPTG	A*02:01 [194]	Bcell(IgA) [78]
D**DESGQKKL**HGLQAILV	YLF**DESGEFKL**	DESGQKKL / DESGEFKL	DR [99]; B*07:02 [175]; HLA-II [172]; DR1 [195]; A*01:01 [174]	HLA-I [83]; Tcell [196]; Bcell(IgM) [82]
DYAD**LVKALKKV**VGKDTN	M**LAKALRKV**	LVKALKKV / LAKALRKV	HLA-II [197]	A*02:01; HLA [177]; Bcell(IgA) [78]
T**VLGDSKNN**V	E**VTGDSCNN**YMLTYN	VLGDSKNN / VTGDSCNN	HLA-I [198]	Tcell [77]; Bcell(IgA) [78]
VGE**KAVNPFLA**DVDK	**KLVNKFLA**L	KAVNPFLA / KLVNKFLA	DPA1*02:01/ DPB1*01:01 [199]	Tcell [200]
FDPKEK**DLNETLL**RSLLGGHYD	NTLN**DLNETLV**T	DLNETLL / DLNETLV	Bcell(IgG) [165]	Bcell(IgM) [82]
F**PNKRSFI**LTRSTFAGSG	LPDPSK**PSKRSFI**EDLLFNKVT	PNKRSFI / PSKRSFI	DRB1*07:01 [93]	HLA [95]; Tcell [94]; Bcell(IgG) [85]
TT**LAFQTVK**	AALTNN**VAFQTVK**PGN	LAFQTVK / VAFQTVK	A*11:01 [93]	Bcell(IgG) [201]

VIRKSNGKTLFD**TSIGPLV**YSDQY	**TSFGPLV**RK	TSIGPLV	HLA-II [93]	A*03:01 [190]; Tcell [191]; Bcell(IgA) [78]
		TSFGPLV		
KYVIILDPAISIG	AKH**YVYIGDPA**QLPA	YVIILDPA	DRB1*13:03; HLA-II [93]	Bcell(IgM) [202]
		YVYIGDPA		