IMMUNE EPITOPE DATABASE AND ANALYSIS RESOURCE

Accessing the Data: Query, Reporting, and Examples

www.iedb.org

Presented by: Randi Vita, MD, Lead Ontology and Quality Manager
& Sidne Fitzpatrick, PhD, Curator

Home Page Query

The IEDB has just launched its updated 3D viewers! Learn more via our help article here.

Welcome

The Immune Epitope Database (IEDB) is a freely available resource funded by NIAID. It catalogs experimental data on antibody and T cell epitopes studied in humans, non-human primates, and other animal species in the context of infectious disease, allergy, autoimmunity and transplantation. The IEDB also hosts tools to assist in the prediction and analysis of epitopes.

Learn More

Upcoming Events & News

AAI Exhibitor Booth	May 6-10
FOCiS Exhibitor Booth	June 21-24
Virtual User Workshop	Oct 26-28

* register here

IEDB SARS-CoV-2 Epitope Analysis Videos

Summary Metrics

Peptidic Epitopes	1,539,160
Non-Peptidic Epitopes	3,146
T Cell Assays	443,436
B Cell Assays	1,332,346
MHC Ligand Assays	4,631,825
Epitope Source Organisms	4,233
Restricting MHC Alleles	969
References	23,292

START YOUR SEARCH HERE

1 Epitope

- (•) Any
- ( ) Linear peptide — Exact M — Ex: SIINFEKL
- ( ) Discontinuous
- ( ) Non-peptidic

5 Assay

- [x] T Cell
- [x] B Cell
- [x] MHC Ligand

Ex: neutralization — Find

Outcome: [x] Positive [ ] Negative

2 Epitope Source

Organism

Ex: influenza, peanut — Find

3 Antigen

Ex: core, capsid, myos — Find

6 MHC Restriction

- (•) Any
- ( ) Class I
- ( ) Class II
- ( ) Non-classical
- ( ) Ex: HLA-A*02:01 — Find

4 Host

- (•) Any
- ( ) Human
- ( ) Mouse
- ( ) Non-human primate
- ( ) Ex: dog, camel — Find

7 Disease

- (•) Any
- ( ) Infectious
- ( ) Allergic
- ( ) Autoimmune
- ( ) Ex: asthma — Find

Reset | Search

Epitope Analysis Resource

T Cell Epitope Prediction

Scan an antigen sequence for amino acid patterns indicative of:

- MHC I Binding
- MHC II Binding
- MHC I Processing (Proteasome,TAP)
- MHC I Immunogenicity

B Cell Epitope Prediction

Predict linear B cell epitopes using:

- Antigen Sequence Properties

Predict discontinuous B cell epitopes using antigen structure via:

- Discotope
- ElliPro

Epitope Analysis Tools

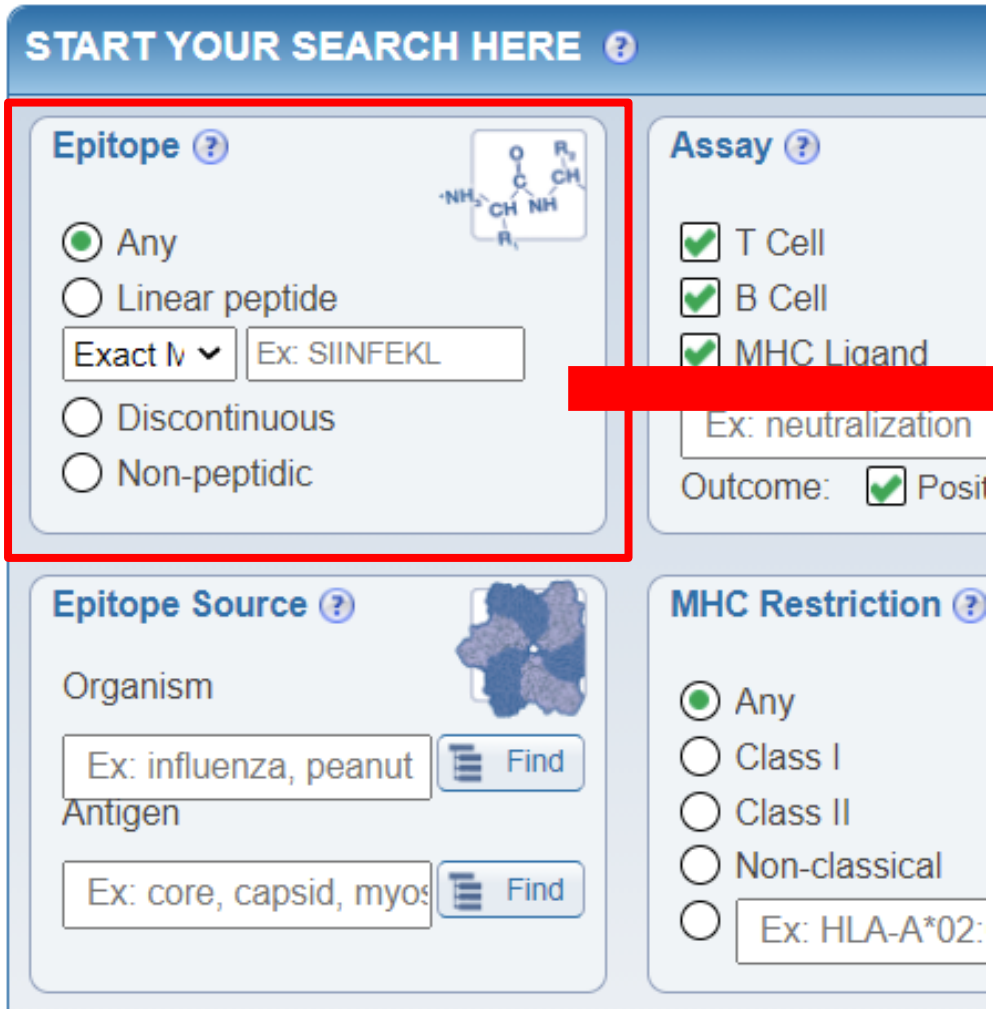
Analyze epitope sets of:

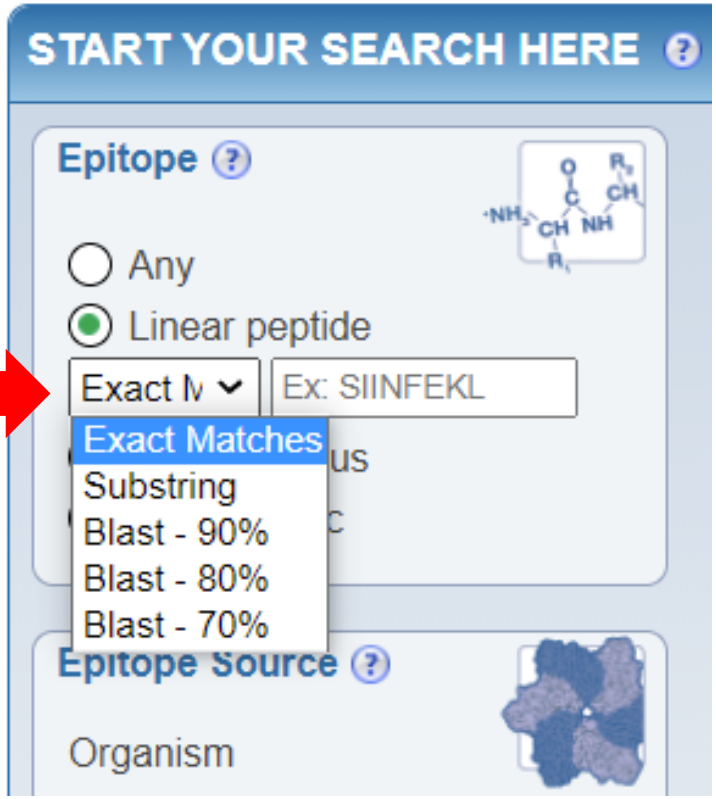
- Population Coverage
- Conservation Across Antigens
- Clusters with Similar Sequences

Supported by a contract from the National Institute of Allergy and Infectious Diseases, a component of the National Institutes of Health in the Department of Health and Human Services.

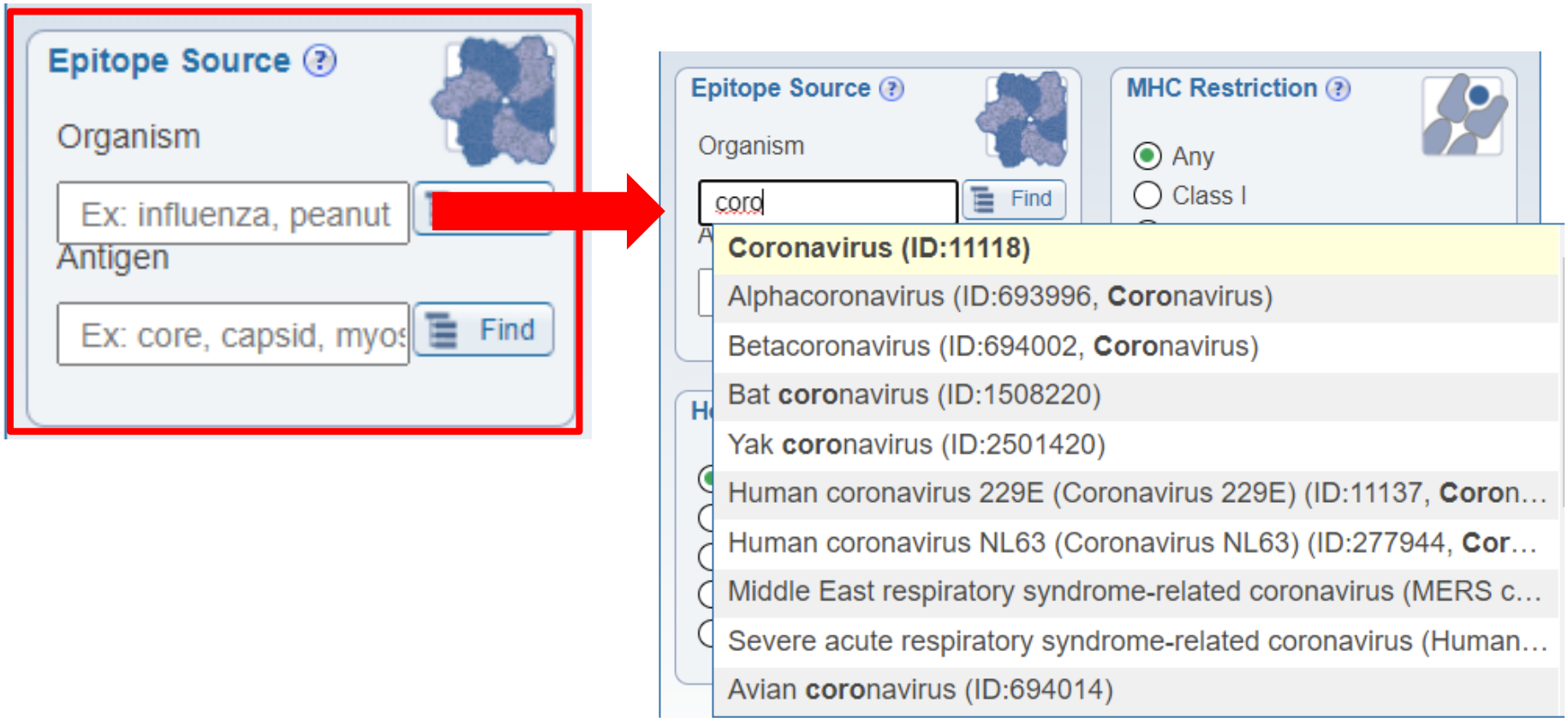
Epitope Search Pane

Search by epitope sequence

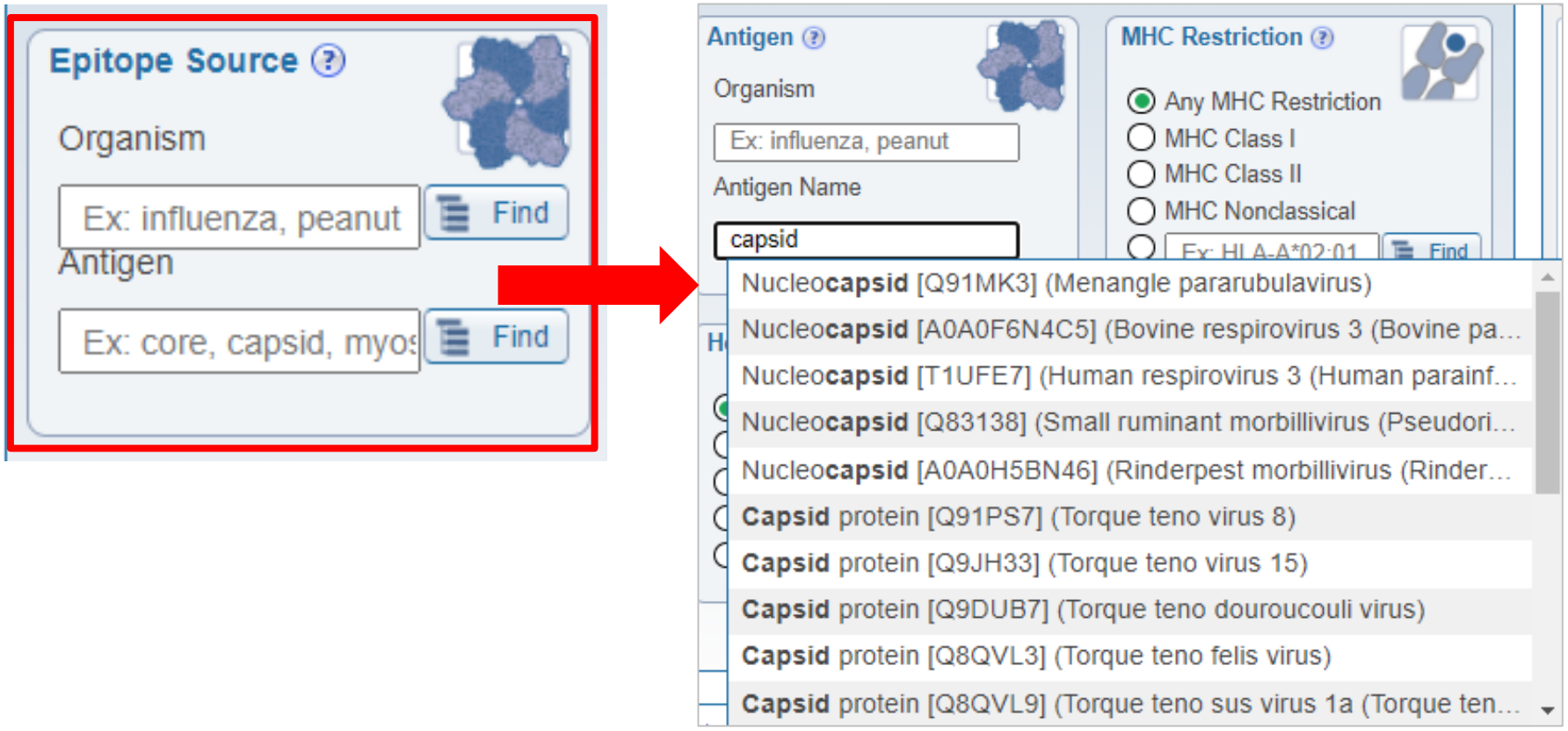




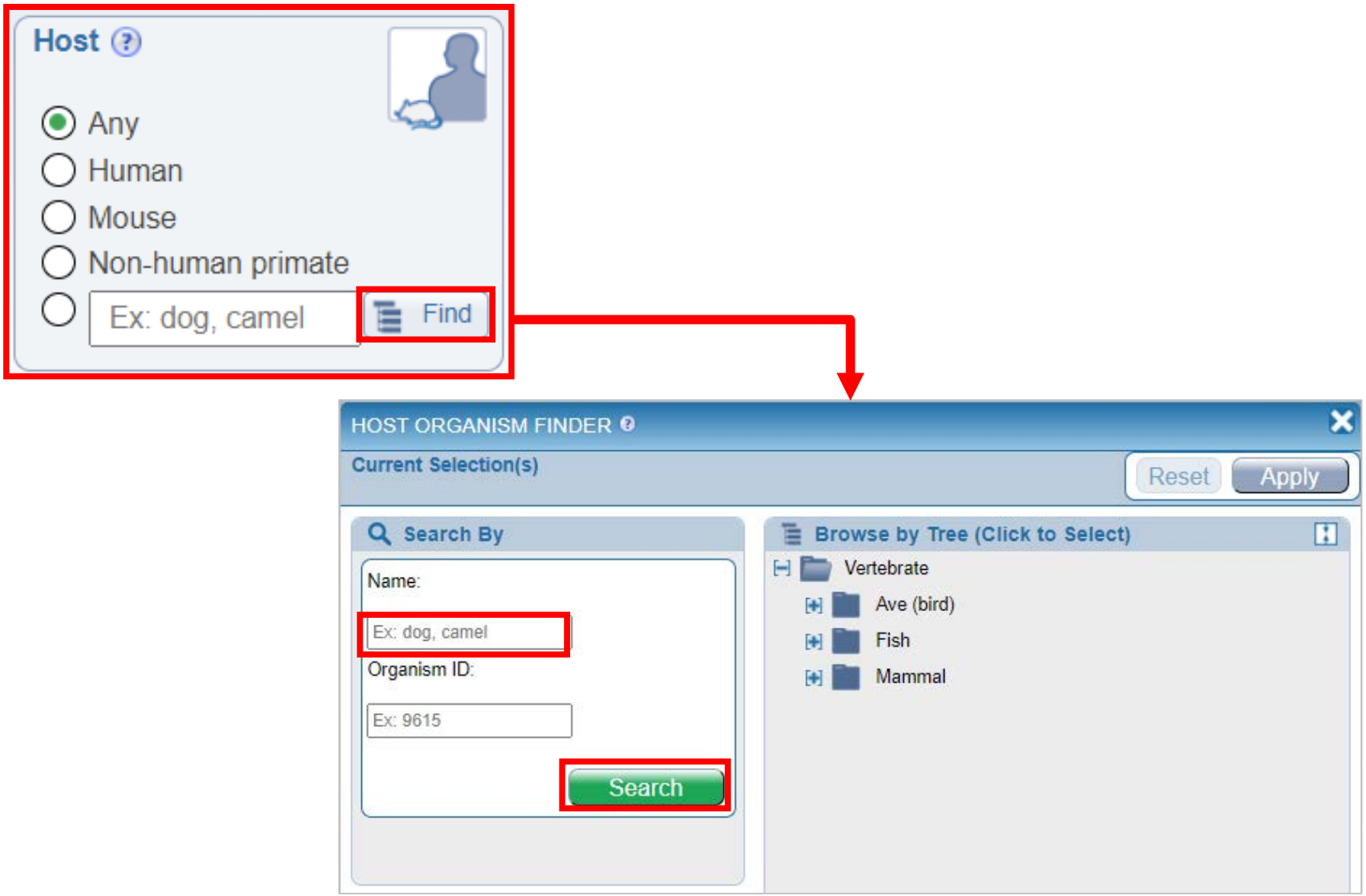
Antigen Search Pane: Organism



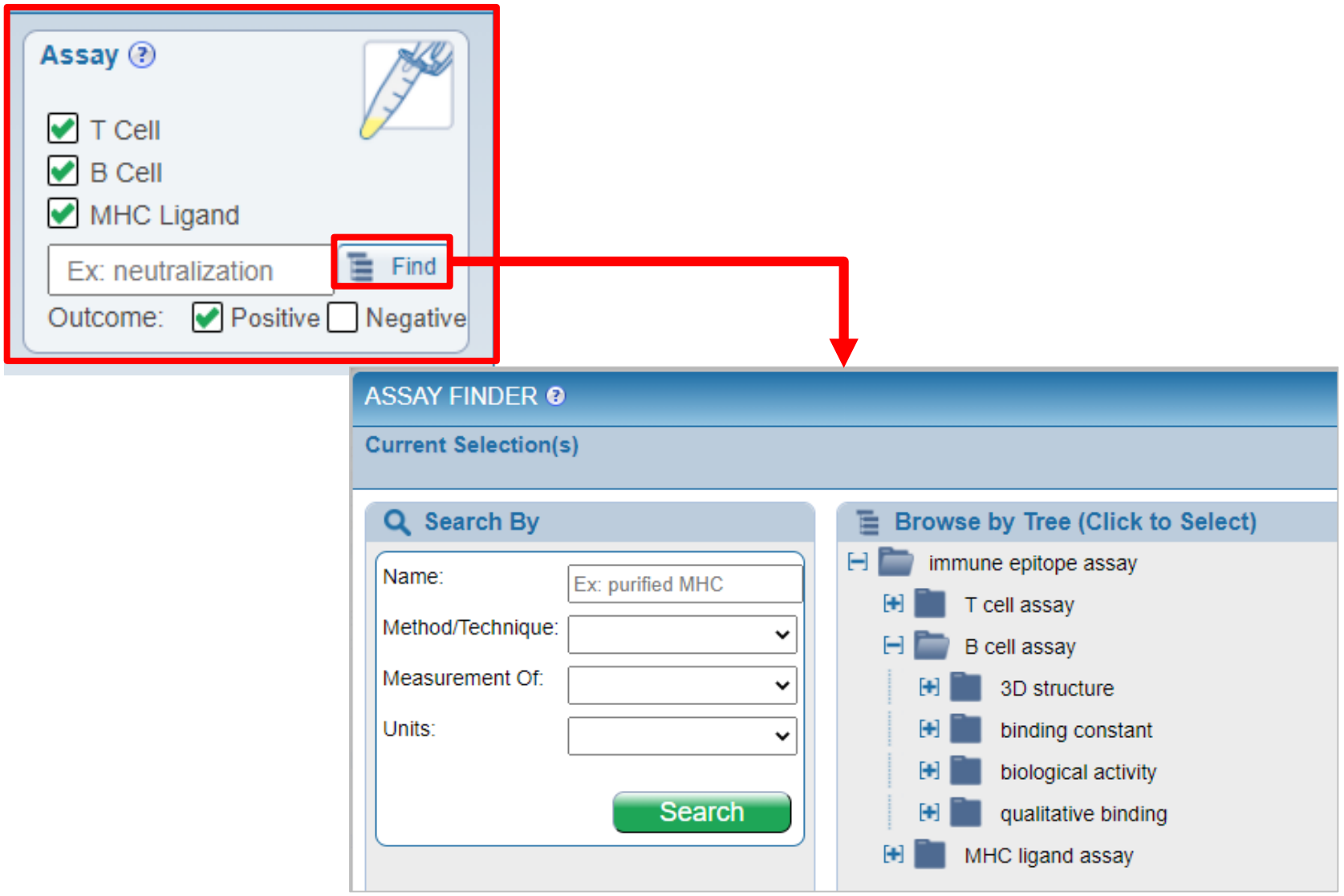
Antigen Search Pane: Antigen



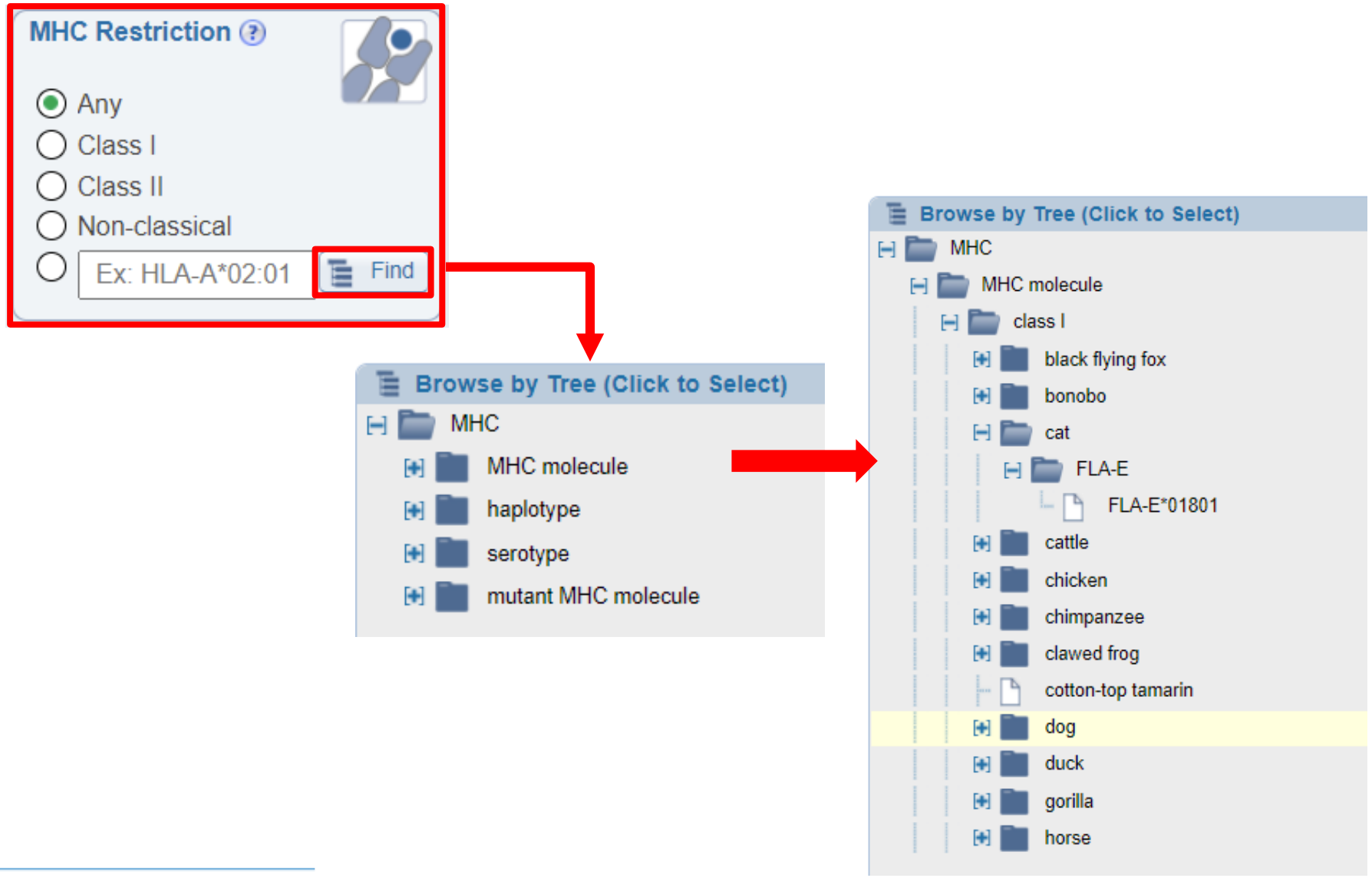
Host Search Pane



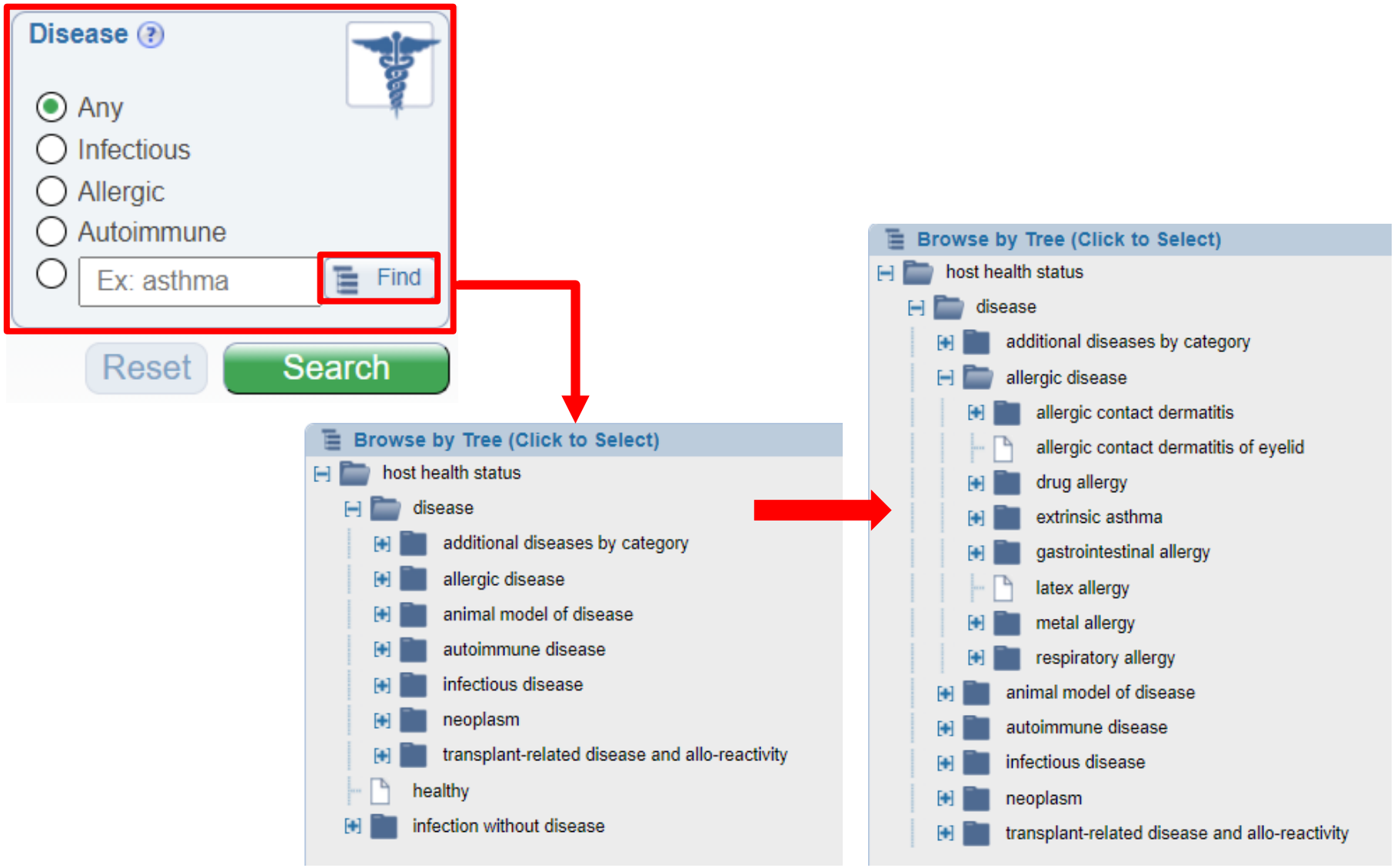
Assay Search Pane



MHC Restriction Search Pane

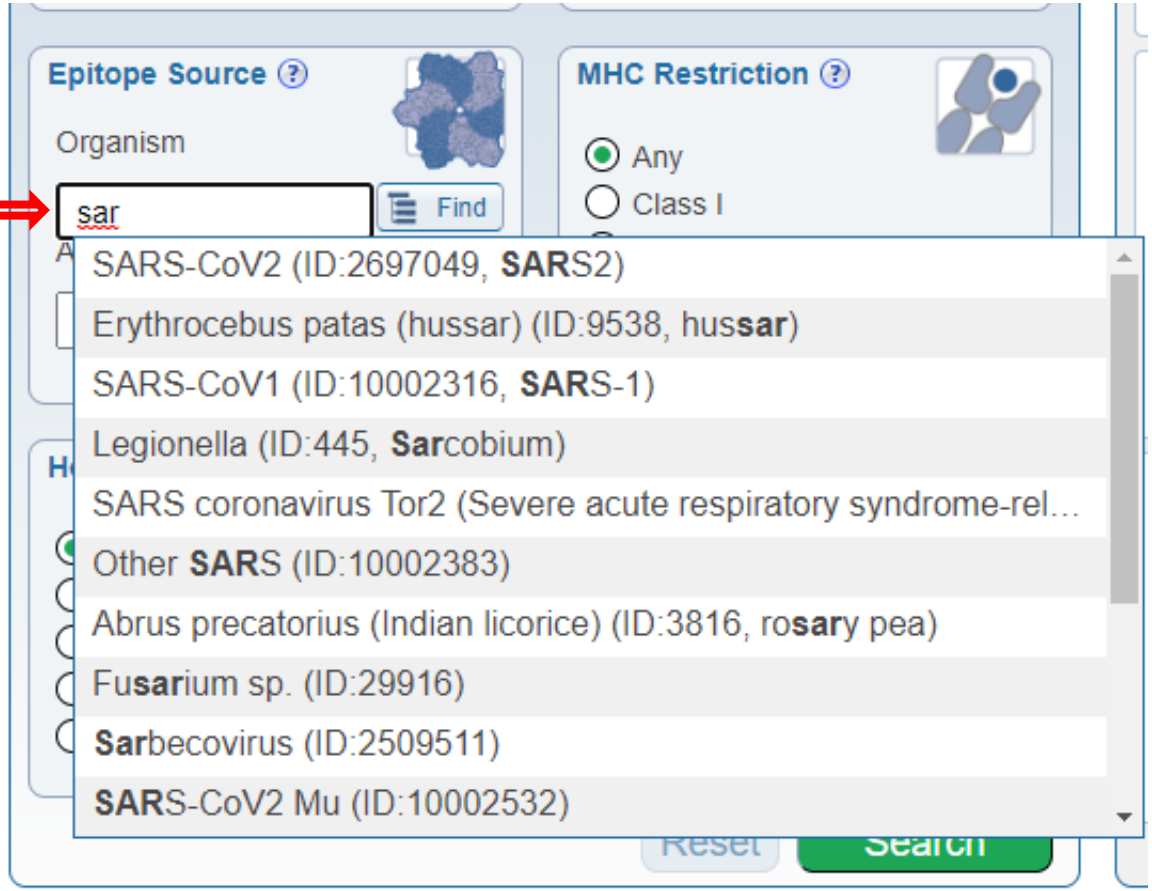


Disease Search Pane



User Queries: How to see the differences between B and T cell responses for SARS-CoV2

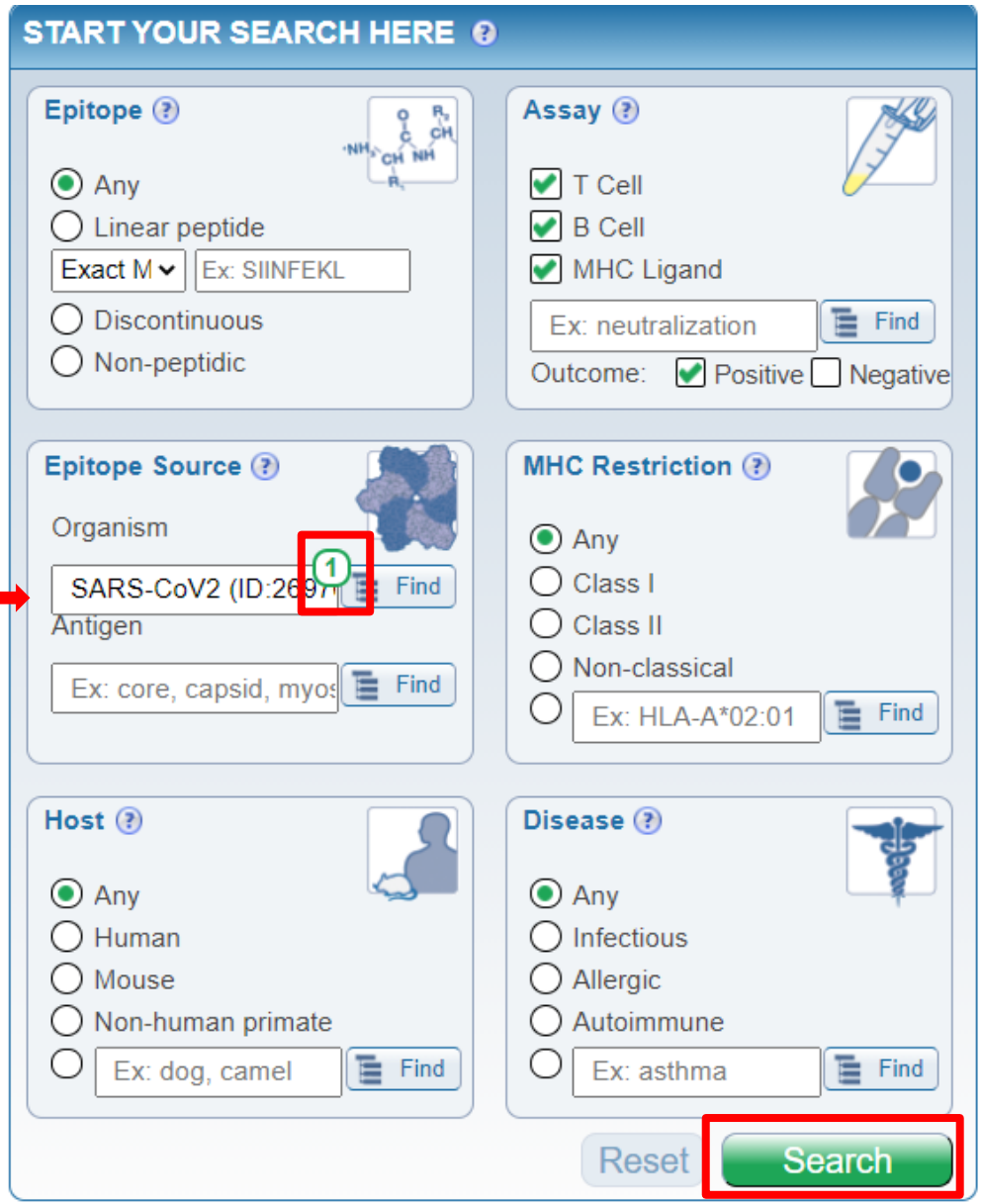
Start typing the organism name and autocomplete will provide options for which the IEDB has data



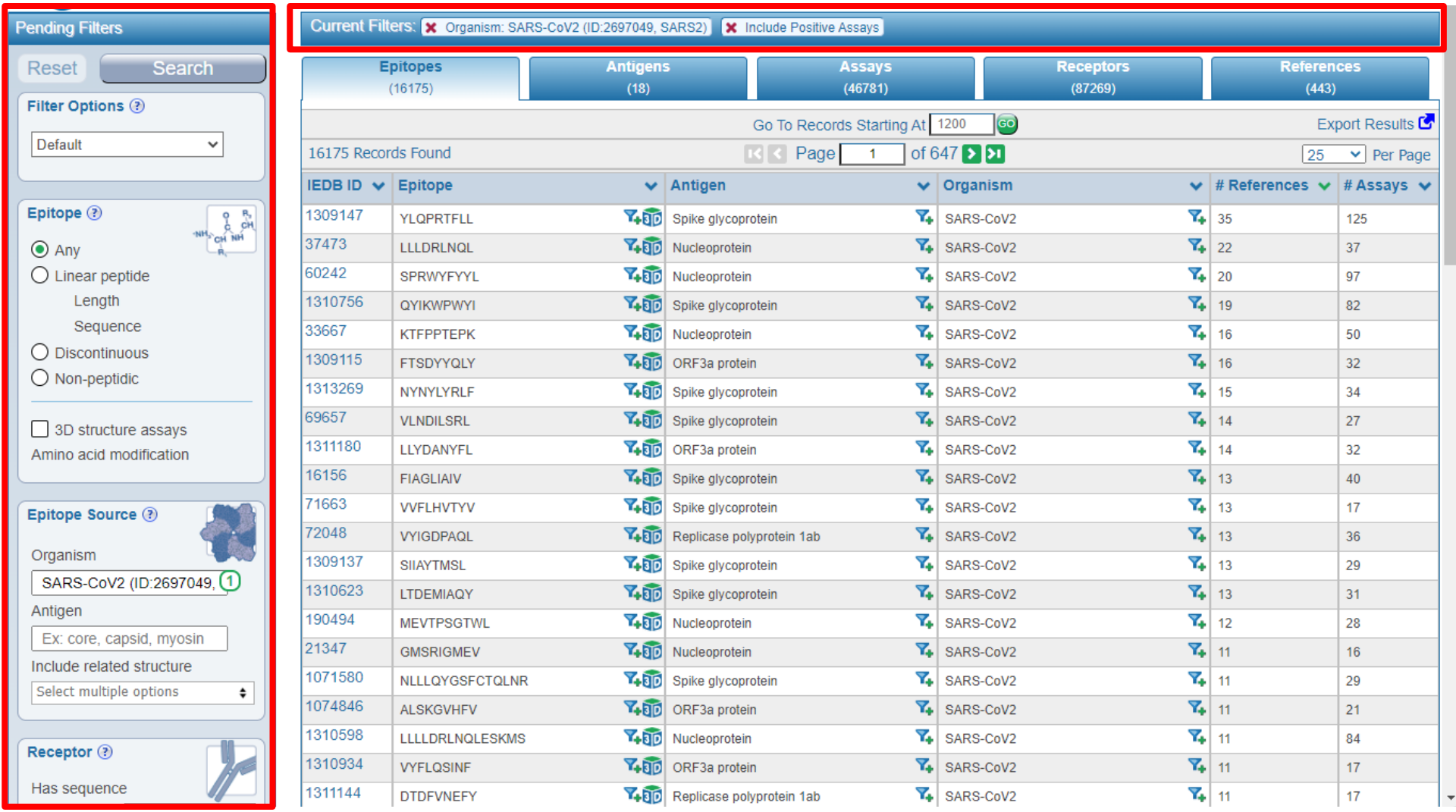
User Queries: How to see the differences between B and T cell responses for SARS-CoV2

Select SARS-CoV2
This is a multi-select field
The number displays how many selections you have made
Once your query is built, click "Search"

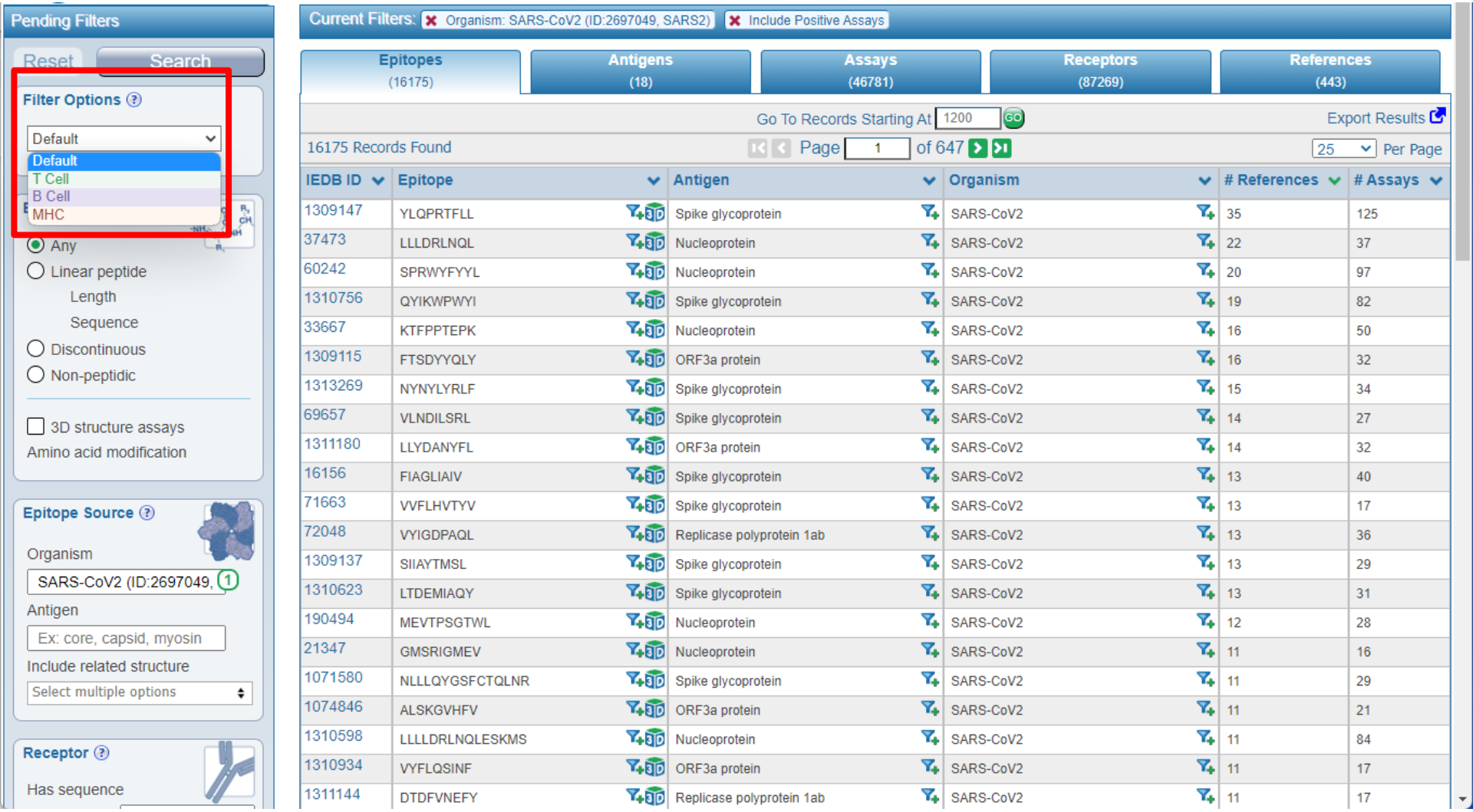
**You can select from all search panes or from none



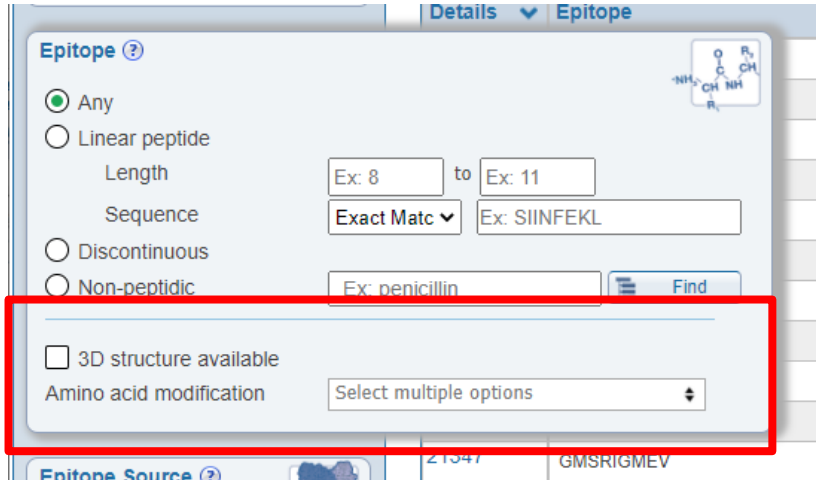
Results Page: Pending Filters/Current Filters

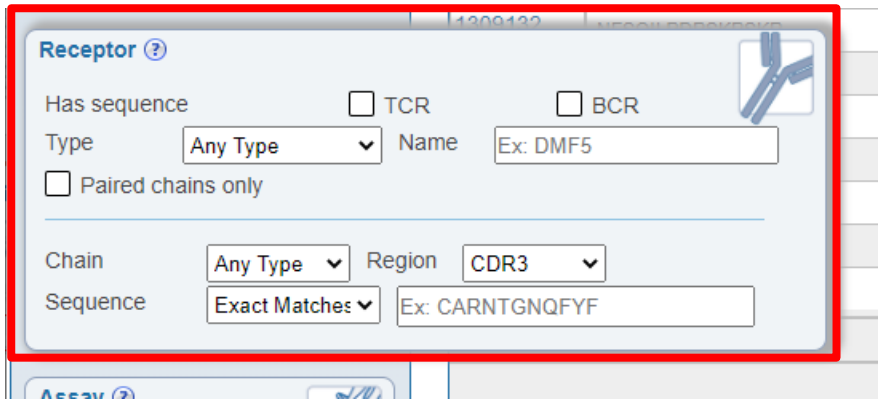


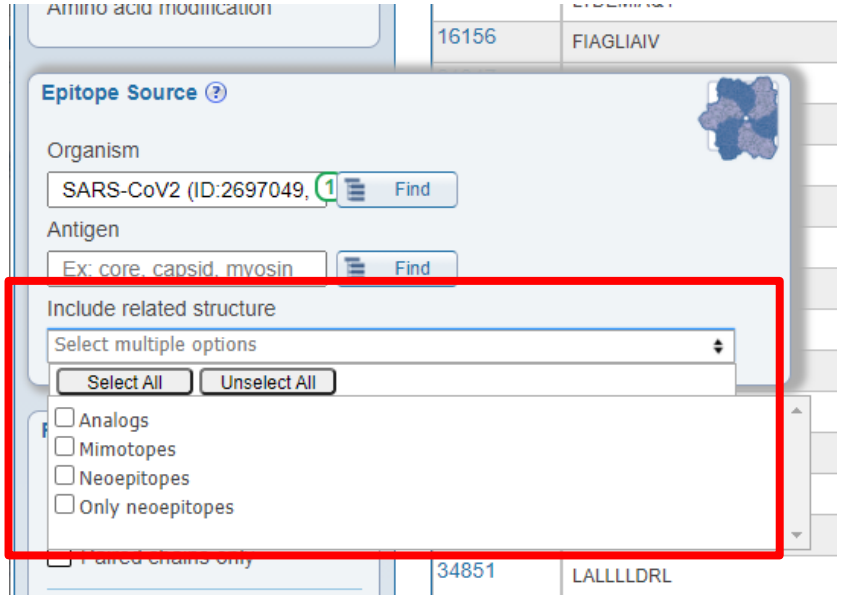
Results Page: Pending Filters/Filter Options



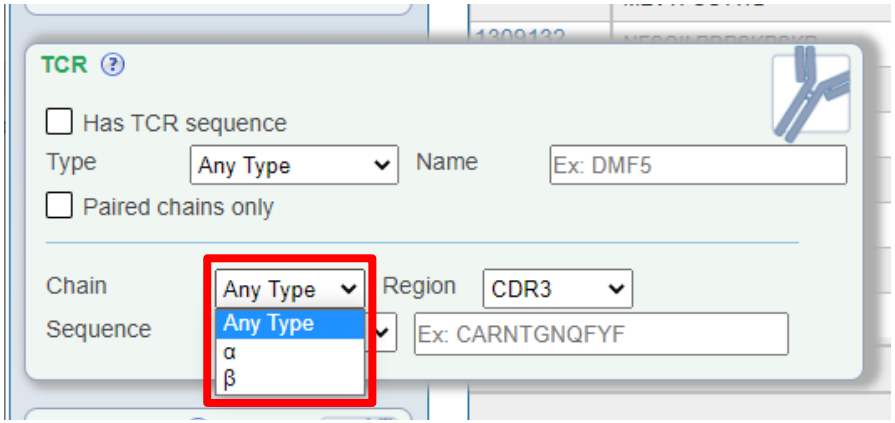
Results Page: Additional Filter Options - Default

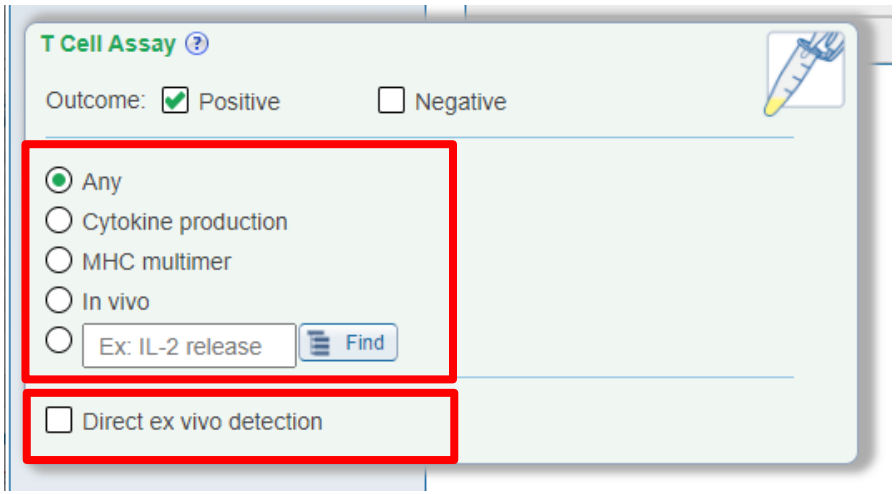


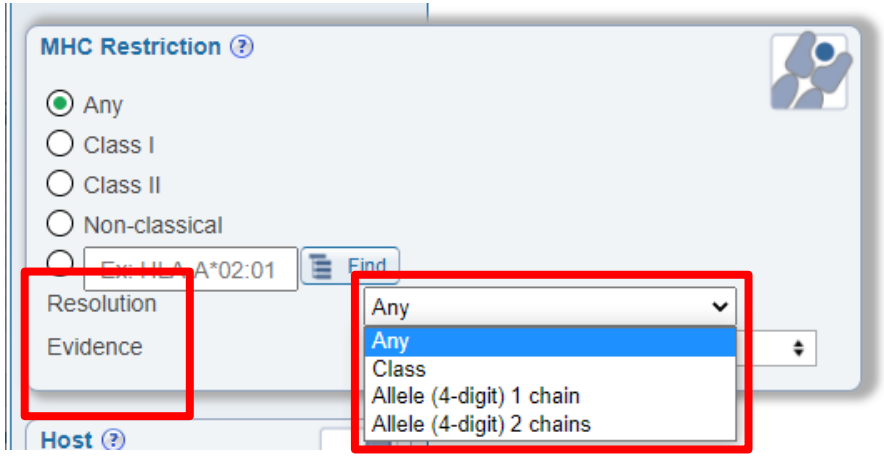


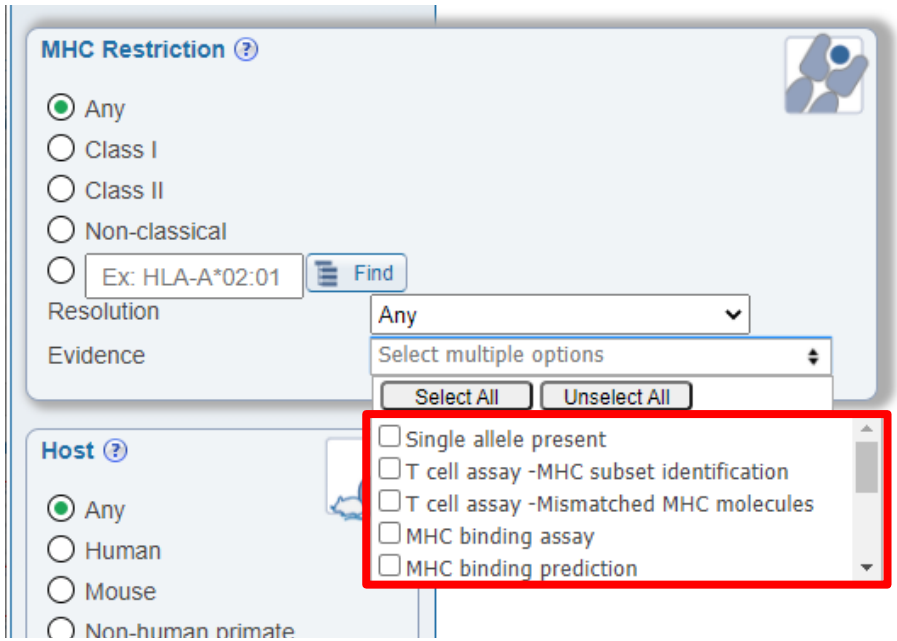


Results Page: Additional Filter Options – T Cell

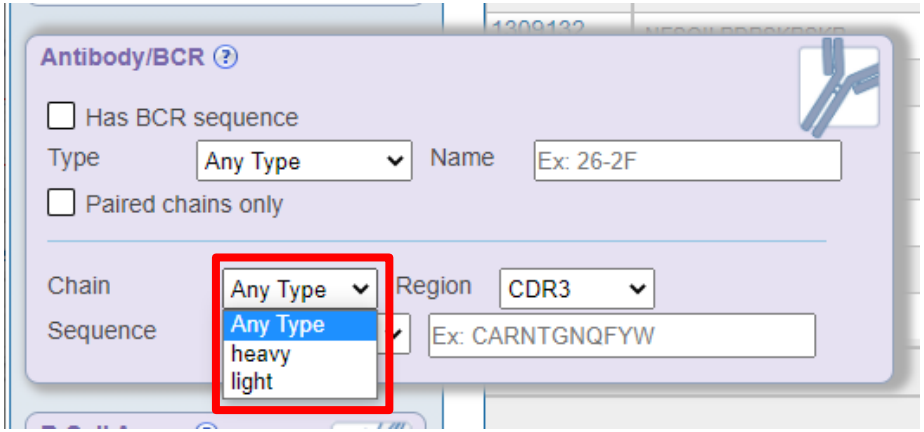


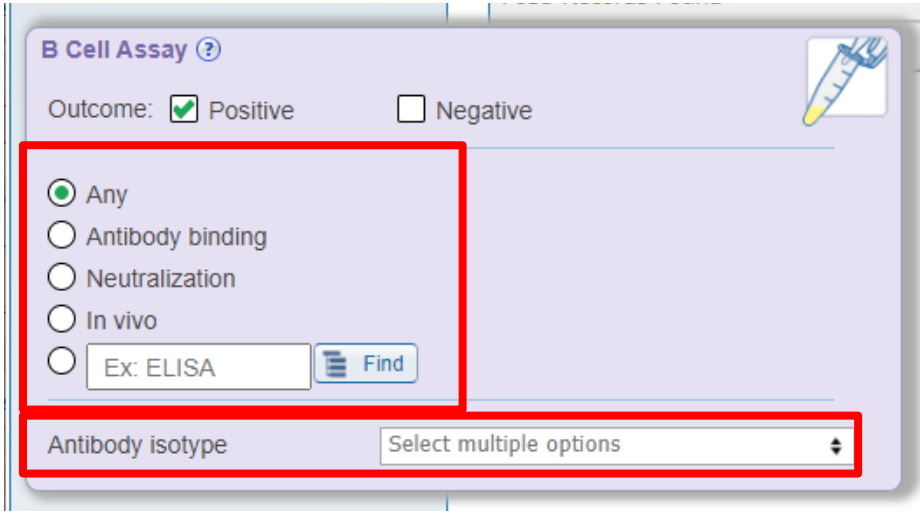




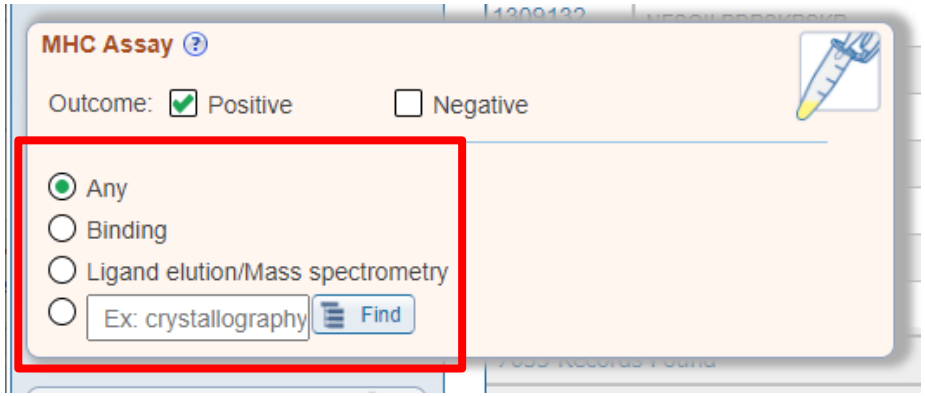


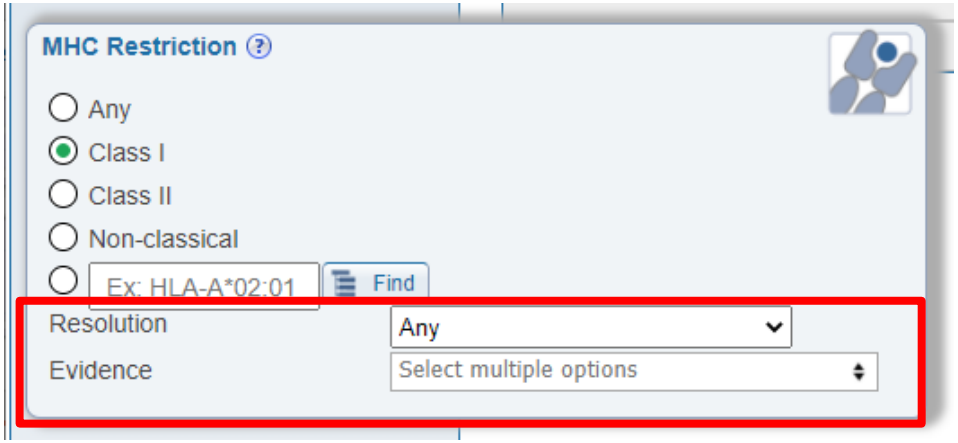
Results Page: Additional Filter Options – B Cell



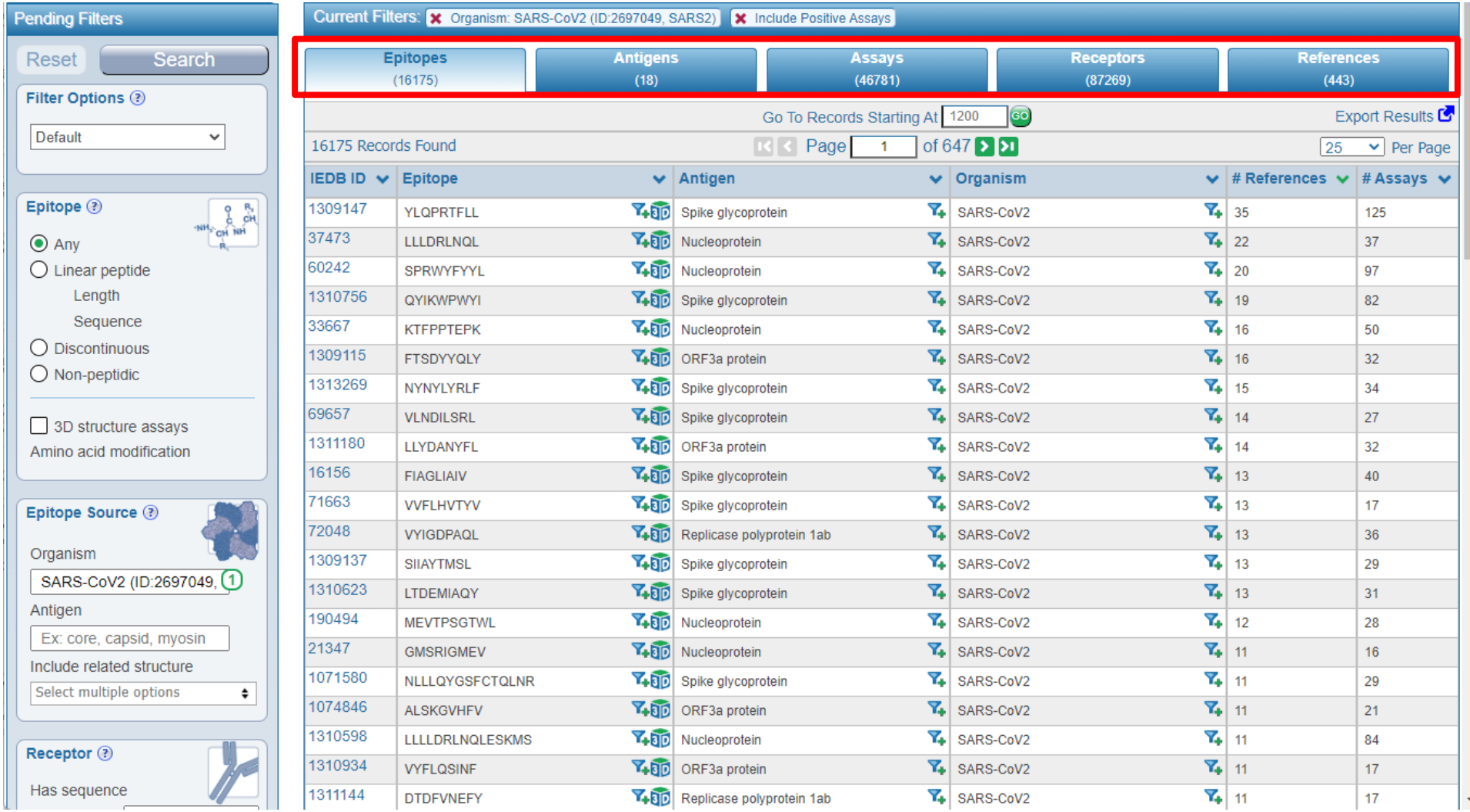


Results Page: Additional Filter Options – MHC

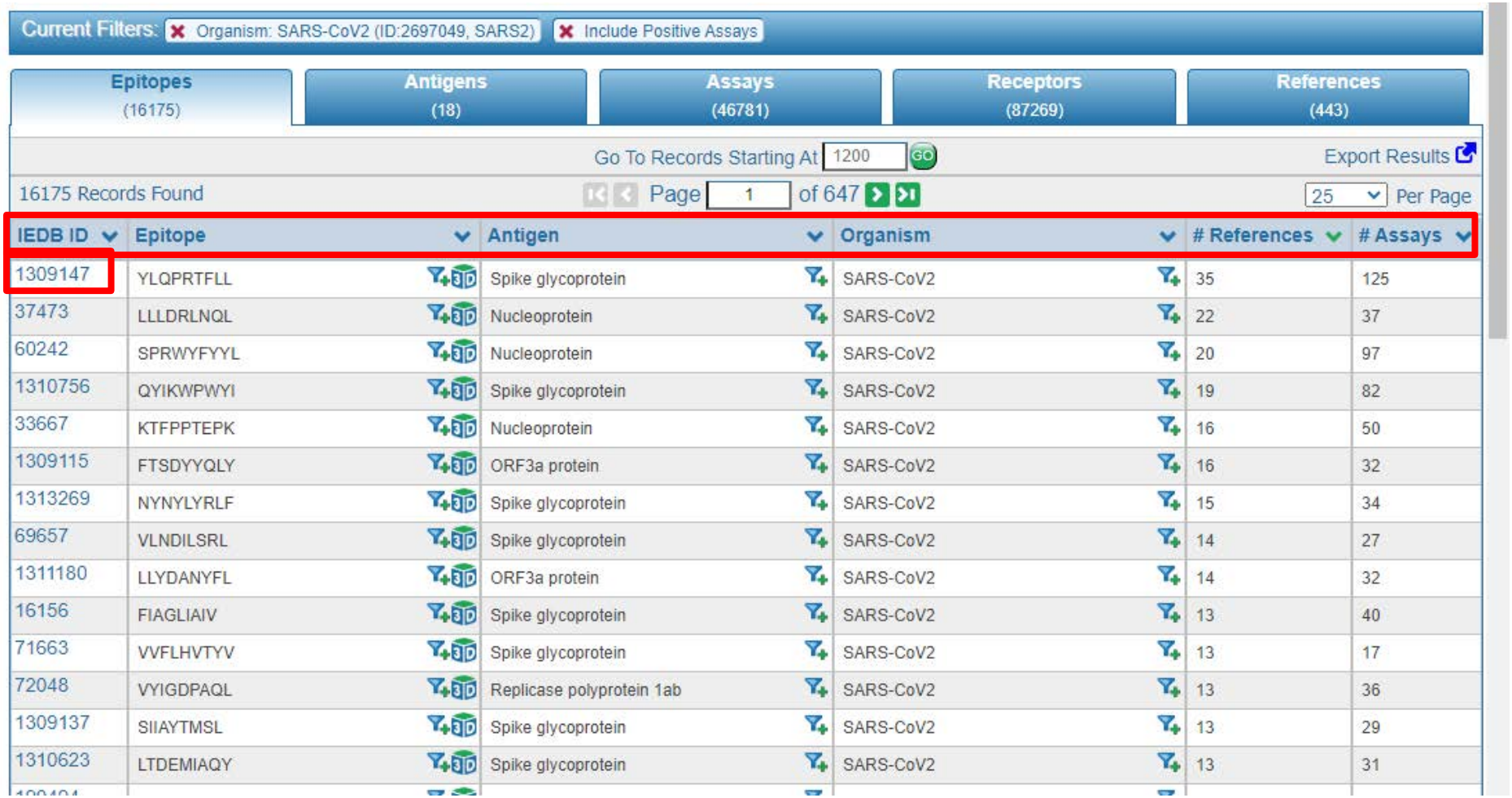




Results Page: Epitope Tab



Results Page: Epitope Table Headers



Current Filters: Organism: SARS-CoV2 (ID:2697049, SARS2) | Include Positive Assays

Epitopes (16175) | Antigens (18) | Assays (46781) | Receptors (87269) | References (443)

Go To Records Starting At 1200 GO | Export Results

16175 Records Found | Page 1 of 647 | 25 Per Page

IEDB ID	Epitope	Antigen	Organism	# References	# Assays
1309147	YLQPRTFLL	Spike glycoprotein	SARS-CoV2	35	125
37473	LLLDRLNQL	Nucleoprotein	SARS-CoV2	22	37
60242	SPRWYFYYL	Nucleoprotein	SARS-CoV2	20	97
1310756	QYIKWPWYI	Spike glycoprotein	SARS-CoV2	19	82
33667	KTFPPTEPK	Nucleoprotein	SARS-CoV2	16	50
1309115	FTSDYYQLY	ORF3a protein	SARS-CoV2	16	32
1313269	NYNYLYRLF	Spike glycoprotein	SARS-CoV2	15	34
69657	VLNDILSRL	Spike glycoprotein	SARS-CoV2	14	27
1311180	LLYDANYFL	ORF3a protein	SARS-CoV2	14	32
16156	FIAGLIAIV	Spike glycoprotein	SARS-CoV2	13	40
71663	VVFLHVTYV	Spike glycoprotein	SARS-CoV2	13	17
72048	VYIGDPAQL	Replicase polyprotein 1ab	SARS-CoV2	13	36
1309137	SIIAYTMSL	Spike glycoprotein	SARS-CoV2	13	29
1310623	LTDEMIAQY	Spike glycoprotein	SARS-CoV2	13	31

Results Page: Epitope Details

EPITOPE SUMMARY

YLQPRTFLL is a linear peptidic epitope (epitope ID 1309147) studied as part of Spike glycoprotein from SARS-CoV2. This epitope has been studied for immune reactivity in 37 publication(s), tested in 127 T cell assays, 11 MHC ligand assays and has 3D structure(s) 7N1F, 7PBE, 7N1A, 7N6E, 7N6D and 7P3D.

COMPILED DATA

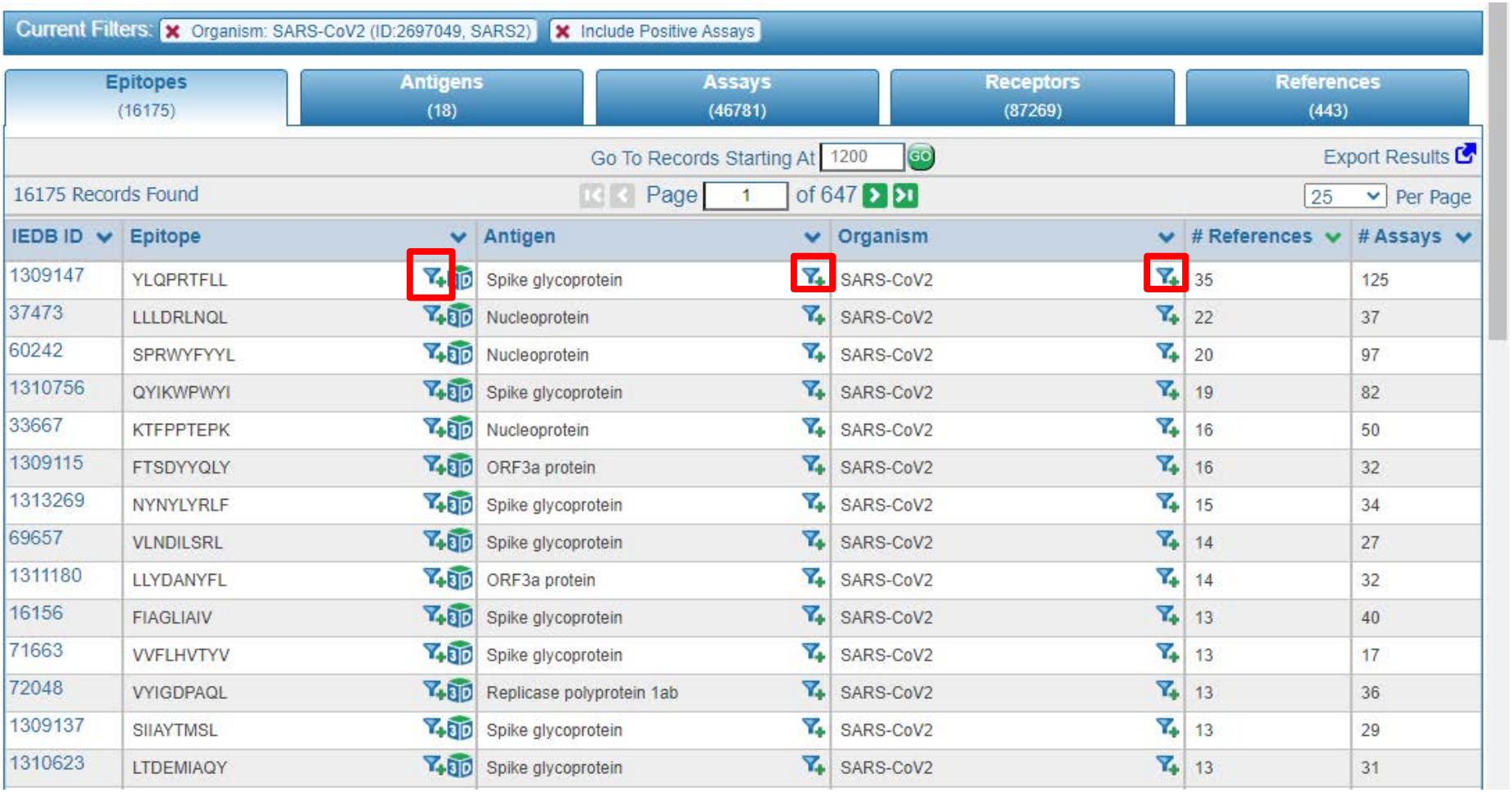
MHC Ligand Assay(s) 11

MHC molecule	Positive / All
HLA-A*02:01	11/11

T Cell Assay(s) 127

Assay Type	Positive / All
qualitative binding	51/59
IFNg release	19/22
dissociation constant KD	9/10
activation	9/9
CCL4/MIP-1b release	4/4
granzyme B release	4/4
TNFa release	4/4
3D structure	3/3
degranulation	3/3
perforin release	3/3
cytotoxicity	2/3
granzyme A release	2/2
proliferation	1/1

Results Pages: All Have Inline Filters



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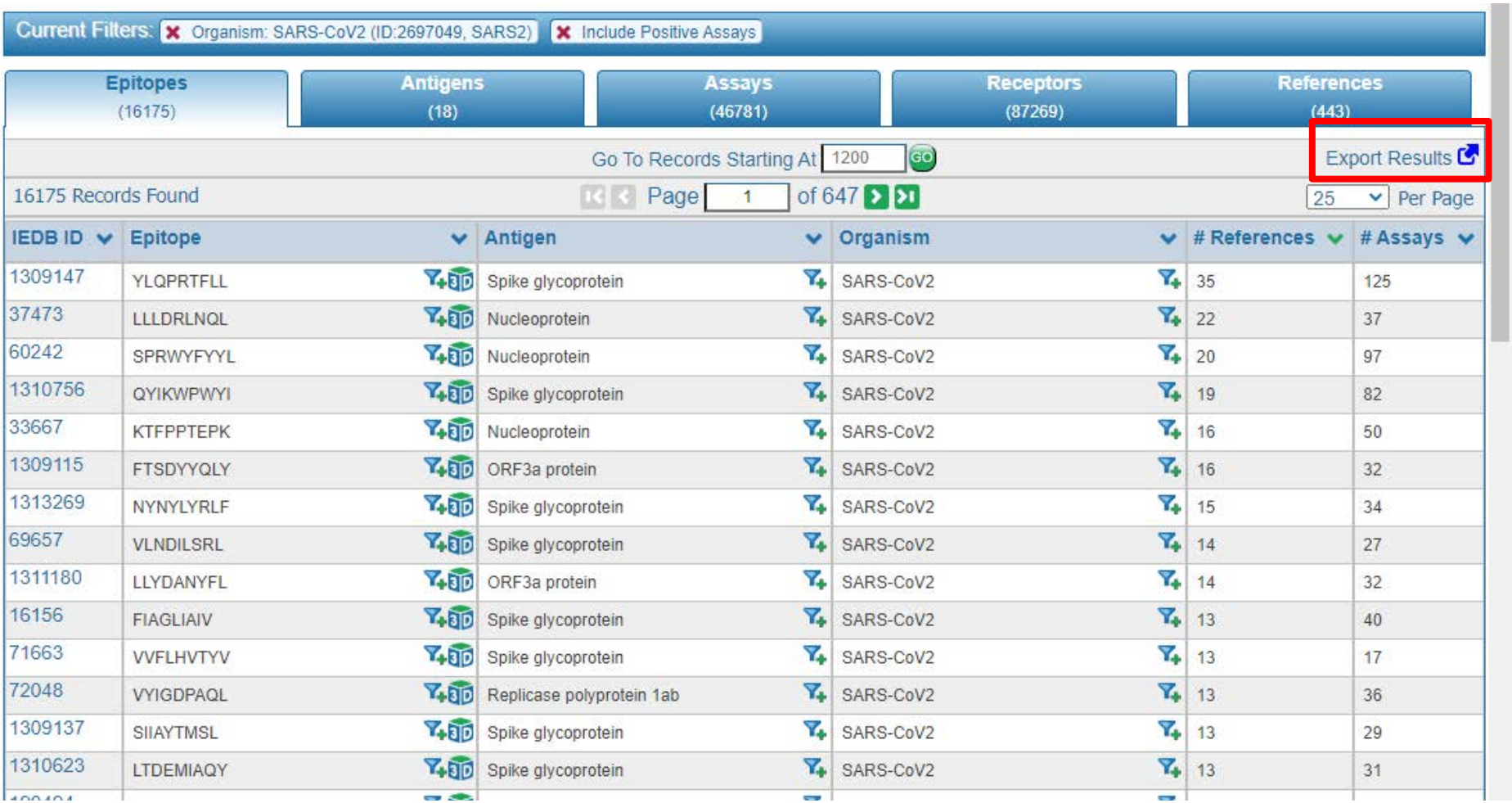
1310623	LTDEMIAQY	Spike glycoprotein	SARS-CoV2	13	31

Results Pages: All Have Exports Options



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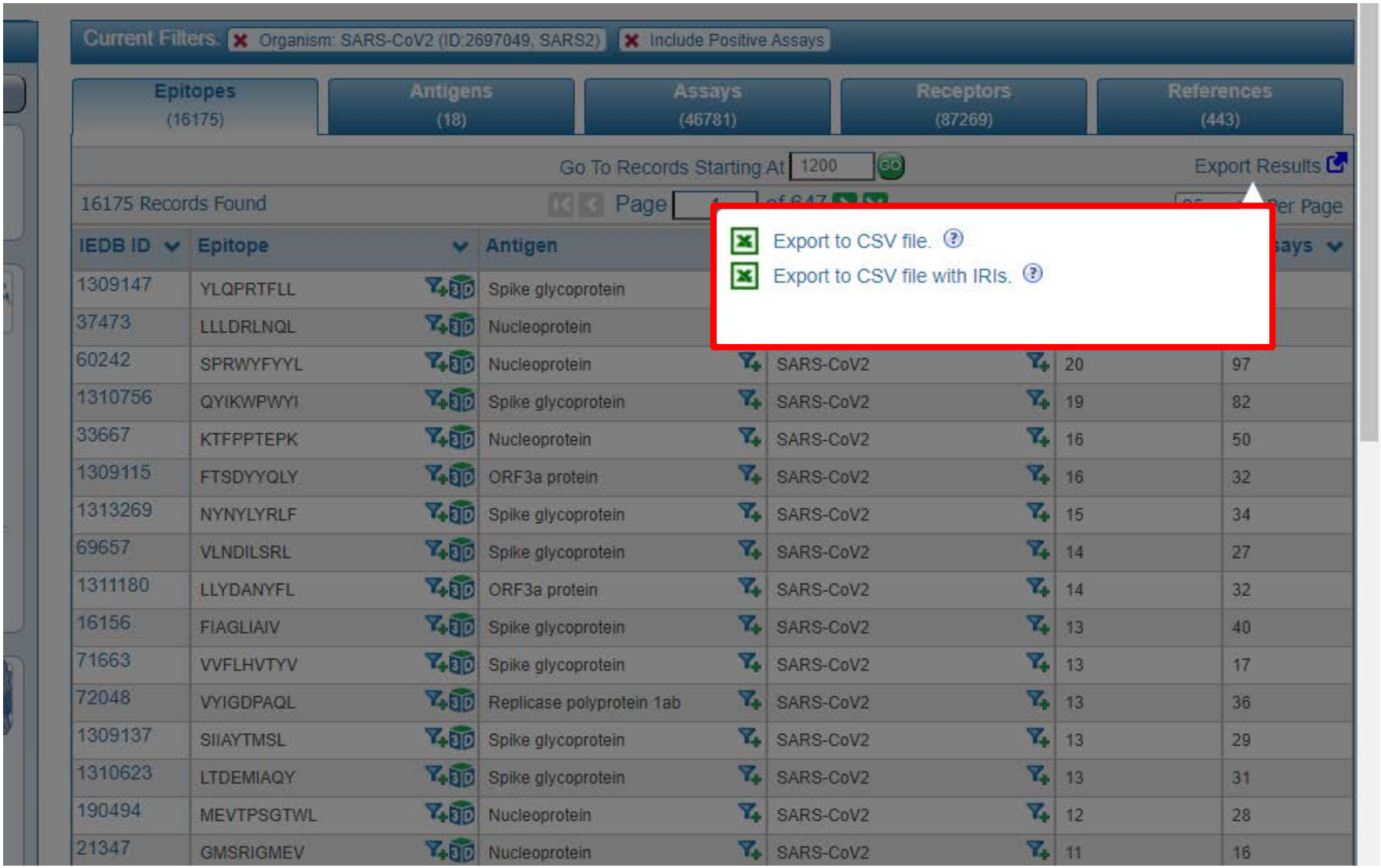
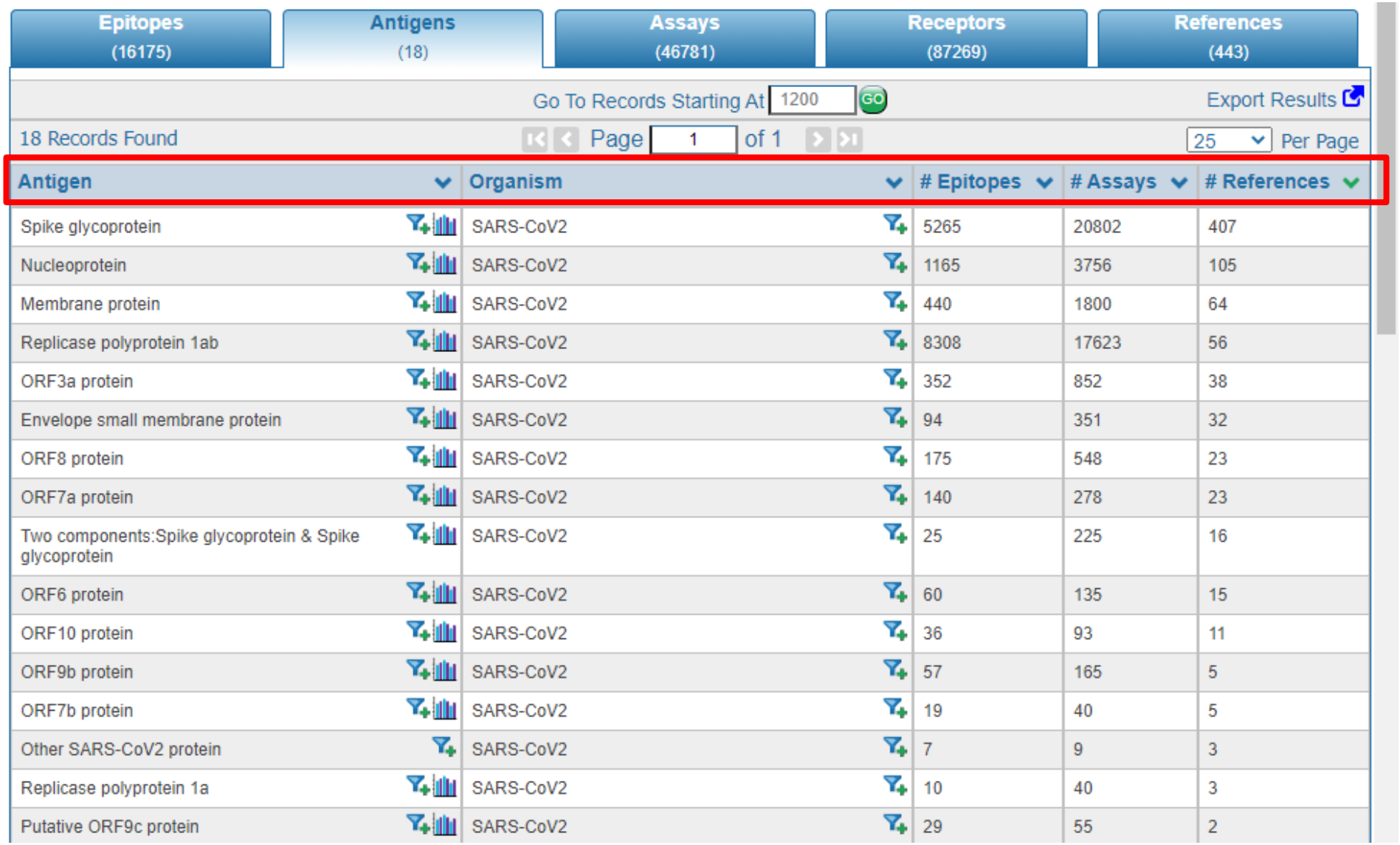
Results Pages: All Have Export Options



Results Page: Antigen Tab – Table Headers



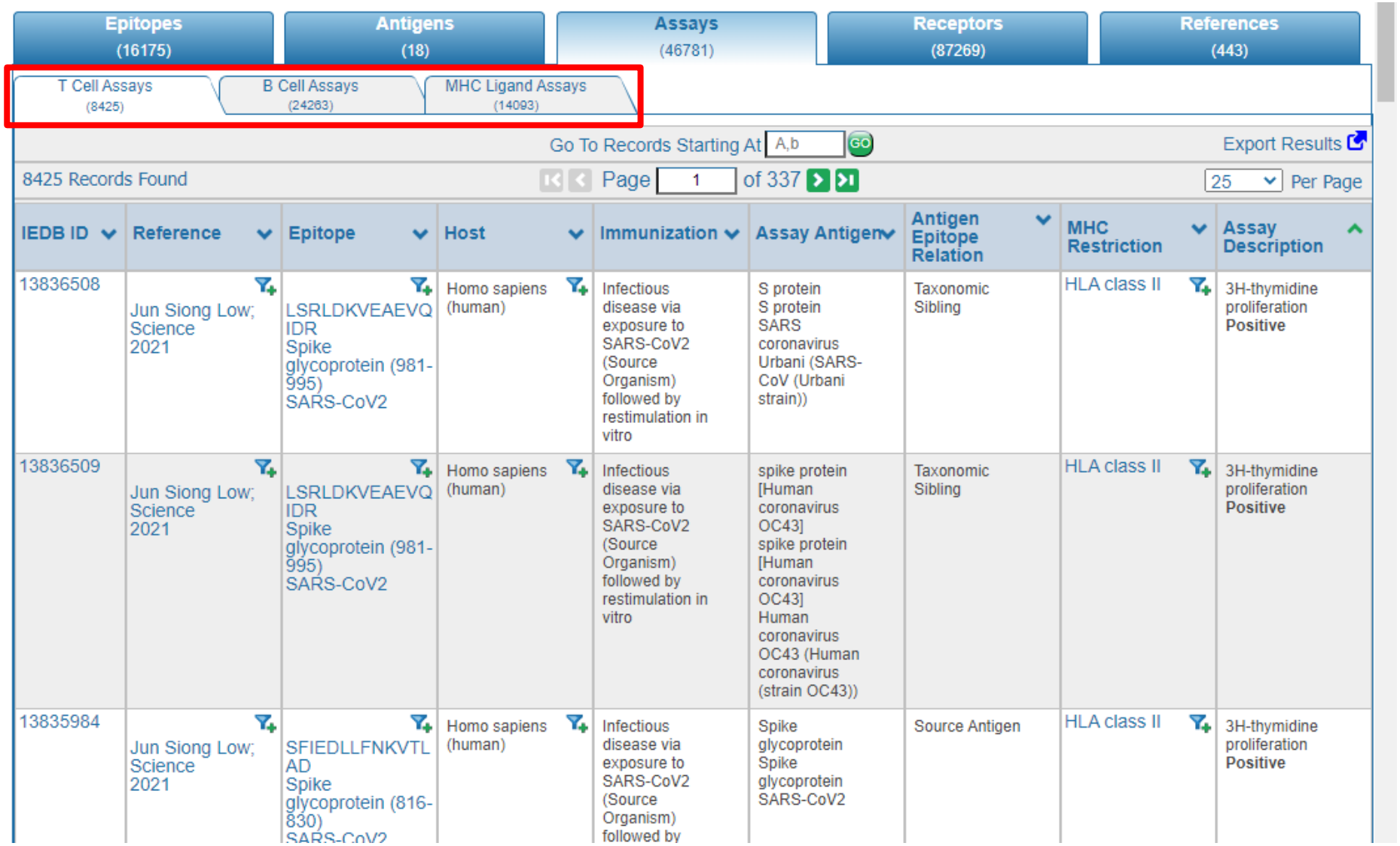
Epitopes (16175) | Antigens (18) | Assays (46781) | Receptors (87269) | References (443)

Go To Records Starting At 1200 GO — Export Results

18 Records Found — Page 1 of 1 — 25 Per Page

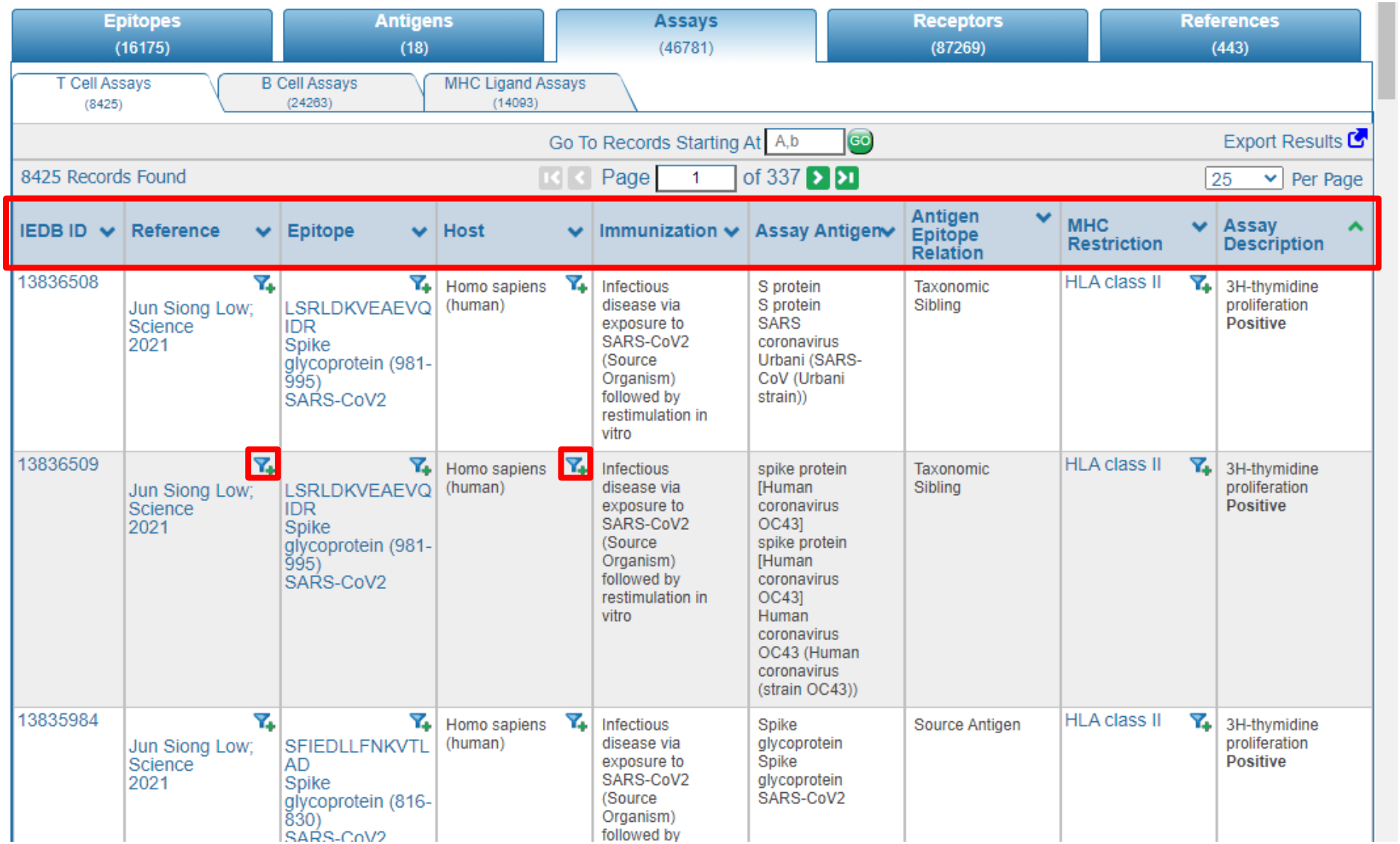
Antigen	Organism	# Epitopes	# Assays	# References
Spike glycoprotein	SARS-CoV2	5265	20802	407
Nucleoprotein	SARS-CoV2	1165	3756	105
Membrane protein	SARS-CoV2	440	1800	64
Replicase polyprotein 1ab	SARS-CoV2	8308	17623	56
ORF3a protein	SARS-CoV2	352	852	38
Envelope small membrane protein	SARS-CoV2	94	351	32
ORF8 protein	SARS-CoV2	175	548	23
ORF7a protein	SARS-CoV2	140	278	23
Two components:Spike glycoprotein & Spike glycoprotein	SARS-CoV2	25	225	16
ORF6 protein	SARS-CoV2	60	135	15
ORF10 protein	SARS-CoV2	36	93	11
ORF9b protein	SARS-CoV2	57	165	5
ORF7b protein	SARS-CoV2	19	40	5
Other SARS-CoV2 protein	SARS-CoV2	7	9	3
Replicase polyprotein 1a	SARS-CoV2	10	40	3
Putative ORF9c protein	SARS-CoV2	29	55	2

Results Page: Assays Tab – Subtabs



IEDB ID	Reference	Epitope	Host	Immunization	Assay Antigen	Antigen Epitope Relation	MHC Restriction	Assay Description
13836508	Jun Siong Low; Science 2021	LSRLDKVEAEVQIDR Spike glycoprotein (981-995) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by restimulation in vitro	S protein S protein SARS coronavirus Urbani (SARS-CoV (Urbani strain))	Taxonomic Sibling	HLA class II	3H-thymidine proliferation **Positive**
13836509	Jun Siong Low; Science 2021	LSRLDKVEAEVQIDR Spike glycoprotein (981-995) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by restimulation in vitro	spike protein [Human coronavirus OC43] spike protein [Human coronavirus OC43] Human coronavirus OC43 (Human coronavirus (strain OC43))	Taxonomic Sibling	HLA class II	3H-thymidine proliferation **Positive**
13835984	Jun Siong Low; Science 2021	SFIEDLLFNKVTLAD Spike glycoprotein (816-830) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by	Spike glycoprotein Spike glycoprotein SARS-CoV2	Source Antigen	HLA class II	3H-thymidine proliferation **Positive**

Results Page: Assays Tab – Table Headers



Epitopes (16175) | Antigens (18) | Assays (46781) | Receptors (87269) | References (443)

T Cell Assays (8425) | B Cell Assays (24263) | MHC Ligand Assays (14093)

Go To Records Starting At A,b GO Export Results

8425 Records Found Page 1 of 337 25 Per Page

IEDB ID	Reference	Epitope	Host	Immunization	Assay Antigen	Antigen Epitope Relation	MHC Restriction	Assay Description
13836508	Jun Siong Low; Science 2021	LSRLDKVEAEVQIDR Spike glycoprotein (981-995) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by restimulation in vitro	S protein S protein SARS coronavirus Urbani (SARS-CoV (Urbani strain))	Taxonomic Sibling	HLA class II	3H-thymidine proliferation **Positive**
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Results Page: Assays Tab – Assay Details

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IEDB ID	Reference	Epitope	Host	Immunization	Assay Antigen	Antigen Epitope Relation	MHC Restriction	Assay Description
13836508	Jun Siong Low; Science 2021	LSRLDKVEAEVQIDR Spike glycoprotein (981-995) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by restimulation in vitro	S protein S protein SARS coronavirus Urbani (SARS-CoV (Urbani strain))	Taxonomic Sibling	HLA class II	3H-thymidine proliferation **Positive**
13836509	Jun Siong Low; Science 2021	LSRLDKVEAEVQIDR Spike glycoprotein (981-995) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by restimulation in vitro	spike protein [Human coronavirus OC43] spike protein [Human coronavirus OC43] Human coronavirus OC43 (Human coronavirus (strain OC43))	Taxonomic Sibling	HLA class II	3H-thymidine proliferation **Positive**
13835984	Jun Siong Low; Science 2021	SFIEDLLFNKVTLAD Spike glycoprotein (816-830) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by	Spike glycoprotein Spike glycoprotein SARS-CoV2	Source Antigen	HLA class II	3H-thymidine proliferation **Positive**

Results Page: Assays Tab – Assay Details Reference

Reference		
Reference Type	Literature	IEDB_Reference:1038797
Title	Clonal analysis of immunodominance and cross-reactivity of the CD4 T cell response to SARS-CoV-2.	
Authors	Jun Siong Low; Daniela Vaqueirinho; Federico Mele; Mathilde Foglierini; Josipa Jerak; Michela Perotti; David Jarrossay; Sandra Jovic; Laurent Perez; Rosalia Cacciatore; Tatiana Terrot; Alessandra Franzetti Pellanda; Maira Biggiogero; Christian Garzoni; Paolo Ferrari; Alessandro Ceschi; Antonio Lanzavecchia; Federica Sallusto; Antonino Cassotta	
Affiliations	Institute for Research in Biomedicine, Università della Svizzera italiana, 6500 Bellinzona, Switzerland; Laboratory of Immunogenetics, Department of Transfusion Medicine and Immuno-Hematology, Fondazione I.R.C.C.S. Policlinico S. Matteo, 27100 Pavia, Italy; Clinical Trial Unit, Ente Ospedaliero Cantonale, 6500 Bellinzona, Switzerland; Clinic of Internal Medicine and Infectious Diseases, Clinica Luganese Moncucco, 6900 Lugano, Switzerland; Faculty of Biomedical Sciences, Università della Svizzera italiana, 6900 Lugano, Switzerland; Department of Internal Medicine, Ente Ospedaliero Cantonale, 6500 Bellinzona, Switzerland; Prince of Wales Hospital Clinical School, University of New South Wales, Sydney, New South Wales 2052, Australia; Division of Clinical Pharmacology and Toxicology, Institute of Pharmacological Sciences of Southern Switzerland, Ente Ospedaliero Cantonale, 6900 Lugano, Switzerland; Department of Clinical Pharmacology and Toxicology, University Hospital Zurich, 8091 Zurich, Switzerland; National Institute of Molecular Genetics, 20122 Milano, Italy; Institute for Research in Biomedicine, Università della Svizzera italiana, 6500 Bellinzona, Switzerland. federica.sall...	
Journal	Science	PMID:34006597
Year	2021	
Abstract	The identification of CD4⁺ T cell epitopes is instrumental for the design of subunit vaccines for broad protection against coronaviruses. Here, we demonstrate in COVID-19-recovered individuals a robust CD4⁺ T cell response to naturally processed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spike (S) protein and nucleoprotein (N), including effector, helper, and memory T cells. By characterizing 2943 S-reactive T cell clones from 34 individuals, we found that the receptor-binding domain (RBD) is highly immunogenic and that 33% of RBD-reactive clones and 94% of individuals recognized a conserved immunodominant S346-S365 region comprising nested human leukocyte antigen DR (HLA-DR)- and HLA-DP-restricted epitopes. Using pre- and post-COVID-19 samples and S proteins from endemic coronaviruses, we identified cross-reactive T cells targeting multiple S protein sites. The immunodominant and cross-reactive epitopes identified can inform vaccination strategies to counteract emerging SARS-CoV	

Results Page: Assays Tab – Assay Details Epitope

Epitope		
Epitope ID	1310620	IEDB_epitope:1310620
Chemical Type	Linear peptide	
Linear Sequence	LSRLDKVEAEVQIDR	
Source Molecule Name	Spike glycoprotein	UniProt:P0DTC2.1
Source Organism	SARS-CoV2	NCBITaxon:2697049
Starting Position	981	
Ending Position	995	

Epitope Reference Details		
Epitope Structure Defines	Exact Epitope	
Epitope Name	SARS CoV2 S 981-995	
Location of Data in Reference	Supplementary Table S5	

Results Page: Assays Tab – Assay Details in vivo Immunization

Immunization		
Host Organism	Homo sapiens (human)	NCBITaxon:9606

1st In Vivo Process		
In Vivo Process Type	Occurrence of infectious disease	OBI:1110008
Disease State	COVID-19	DOID:0080600
Disease Stage	Post;	

1st Immunogen		
Epitope Relation	Source Organism	
Object Type	Organism	
Organism	SARS-CoV2	NCBITaxon:2697049

Results Page: Assays Tab – Assay Details in vitro Immunization

In Vitro Administration		
In Vitro Process Type	Restimulation in vitro	
Responder Cell Type	PBMC	CL:2000001
Stimulator Cell Type	PBMC	CL:2000001

In Vitro Immunogen		
In Vitro Process Type	Source Antigen	
Chemical Type	Protein	
Molecule Name	Spike glycoprotein	UniProt:P0DTC2.1
Organism	SARS-CoV2	NCBITaxon:2697049

Immunization Comments		
Immunization Comments	Cells from COVID-19 individuals were stimulated with S protein. CSFE cells were expanded and restimulated with S protein from human beta (SARS-CoV, HKU1, and OC43) or alpha (NL63 and 229E) coronaviruses and proliferating T cells were cloned by limiting dilution.	

Results Page: Assays Tab – Assay Details

T Cell Assay		
Qualitative Measurement	Positive	
Method/Technique	3H-thymidine	OBI:1110180
Measurement of	proliferation	

Effector Cells		
Effector Cell Tissue Type	Blood	UBERON:0000178
Effector Cell Type	T cell CD4+	CL:0000624
Effector Cell Culture Conditions	Cell Line / Clone	

Assayed TCR Molecule		
Assayed TCR Molecule Name	P34-NL63-A2	

Antigen Presenting Cells		
Cell Tissue Type	Blood	UBERON:0000178
Cell Type	PBMC	CL:2000001
Cell Culture Conditions	Direct Ex Vivo	

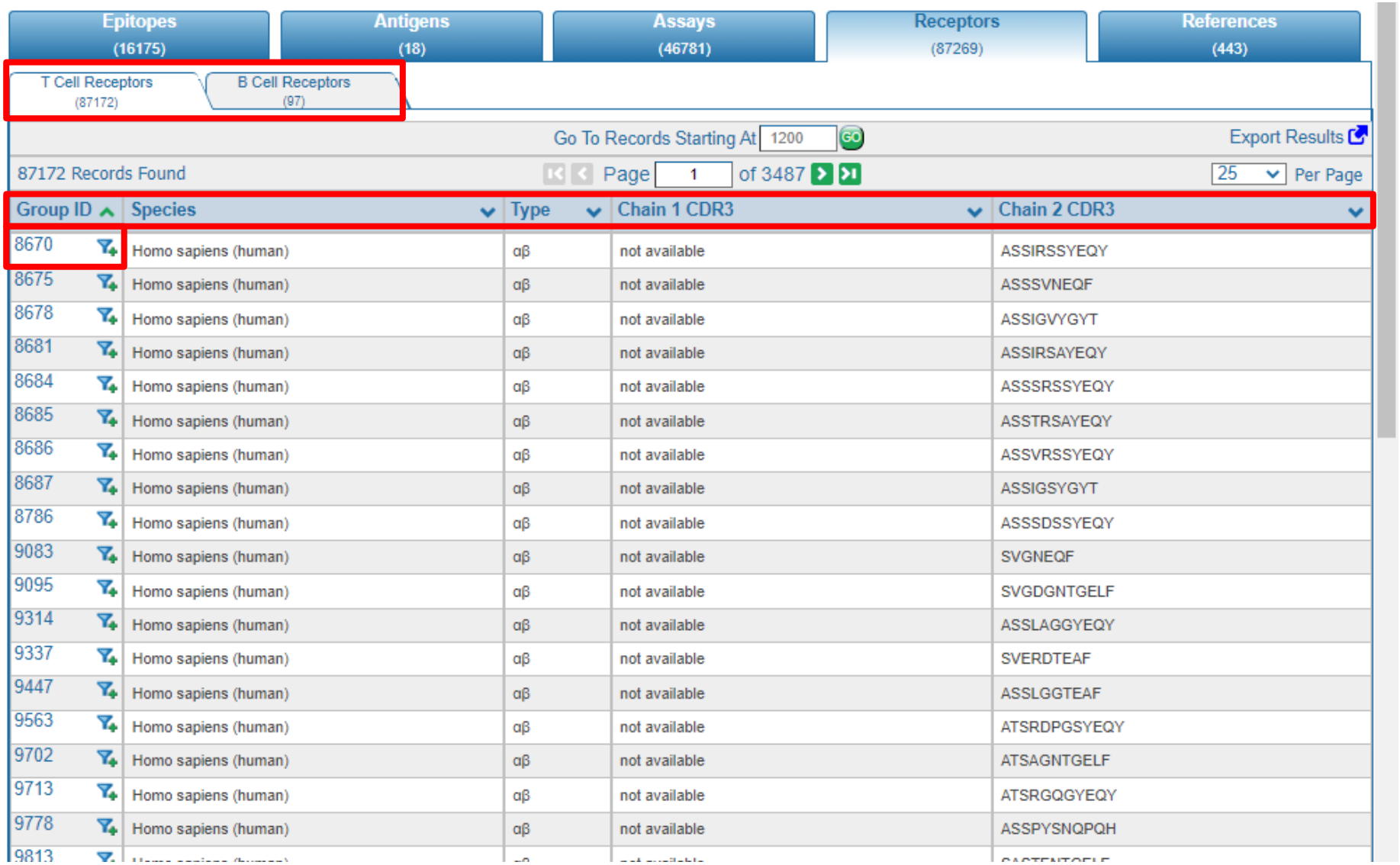
Results Page: Assays Tab – Assay Details

MHC Allele		
MHC Allele Name	HLA class II	MRO:0001455
MHC Evidence Code	T cell assay -T cell subset identification	

Antigen		
Epitope Relation	Taxonomic Sibling	
Chemical Type	Protein	
Molecule Name	S protein	GenPept:AAP13441.1
Organism	SARS coronavirus Urbani (SARS-CoV (Urbani strain))	NCBITaxon:228330

Assay Reference Details		
Assay Comments by IEDB Curator	Epitope-specific clones reacted with the antigen.	
Location of Assay Data in Reference	Table S5	

Results Page: Receptors Tab – Subtabs & Groups



Epitopes (16175) | Antigens (18) | Assays (46781) | Receptors (87269) | References (443)

T Cell Receptors (87172) | B Cell Receptors (97)

Go To Records Starting At 1200 GO — Export Results

87172 Records Found — Page 1 of 3487 — 25 Per Page

Group ID	Species	Type	Chain 1 CDR3	Chain 2 CDR3
8670	Homo sapiens (human)	αβ	not available	ASSIRSSYEQY
8675	Homo sapiens (human)	αβ	not available	ASSSVNEQF
8678	Homo sapiens (human)	αβ	not available	ASSIGVYGYT
8681	Homo sapiens (human)	αβ	not available	ASSIRSAYEQY
8684	Homo sapiens (human)	αβ	not available	ASSSRSSYEQY
8685	Homo sapiens (human)	αβ	not available	ASSTRSAYEQY
8686	Homo sapiens (human)	αβ	not available	ASSVRSSYEQY
8687	Homo sapiens (human)	αβ	not available	ASSIGSYGYT
8786	Homo sapiens (human)	αβ	not available	ASSSDSSYEQY
9083	Homo sapiens (human)	αβ	not available	SVGNEQF
9095	Homo sapiens (human)	αβ	not available	SVGDGNTGELF
9314	Homo sapiens (human)	αβ	not available	ASSLAGGYEQY
9337	Homo sapiens (human)	αβ	not available	SVERDTEAF
9447	Homo sapiens (human)	αβ	not available	ASSLGGTEAF
9563	Homo sapiens (human)	αβ	not available	ATSRDPGSYEQY
9702	Homo sapiens (human)	αβ	not available	ATSAGNTGELF
9713	Homo sapiens (human)	αβ	not available	ATSRGQGYEQY
9778	Homo sapiens (human)	αβ	not available	ASSPYSNQPQH
9813	Homo sapiens (human)	αβ	not available	SASTENTGELF

Results Page: Receptors Tab – Receptor Group

T cell receptor (receptor group ID 8670)

Beta TCR with beta chain CDR3 of ASSIRSSYEQY was reported in Homo sapiens (human).

Gene usage	CDR sequences	beta Gene usage	beta CDR sequences	Epitopes (# assays)
V: D: J:	CDR1: CDR2: CDR3:	V:TRBV19 D: J:TRBJ2-7	CDR1: CDR2: CDR3:ASSIRSSYEQY	GILGFVFTL (1), LLWNGPMAV (1), FLPFFSNVTWFHAI (2), VQPTESIVRFPNITNLCPF (1), YYRARAGEAANF (1)
V Domain:		V Domain:		
V: D: J:	CDR1: CDR2: CDR3:	V:TRBV19 D: J:TRBJ2-7*01	CDR1: CDR2: CDR3:ASSIRSSYEQY	GILGFVFTL (2)
V Domain:		V Domain:		
V: D: J:	CDR1: CDR2: CDR3:	V:TRBV30*01 D: J:TRBJ2-7*01	CDR1: CDR2: CDR3:ASSIRSSYEQY	GILGFVFTL (2)
V Domain:		V Domain:		
V: D: J:	CDR1: CDR2: CDR3:	V:TRBV7-2*01 D: J:TRBJ2-7*01	CDR1: CDR2: CDR3:ASSIRSSYEQY	GILGFVFTL (2)
V Domain:		V Domain:		
V: D: J:	CDR1: CDR2: CDR3:	V:TRBV25-1*01 D: J:TRBJ2-7*01	CDR1: CDR2: CDR3:ASSIRSSYEQY	GILGFVFTL (2)
V Domain:		V Domain:		

Epitope summary

This TCR was studied for the following epitopes GILGFVFTL studied as part of Matrix protein 1 from Influenza A virus (epitope ID 20354, 2 publications, 3 assays), LLWNGPMAV studied as part of Genome polyprotein from Yellow fever virus (Flavivirus febricis) (epitope ID 121572, 1 publication, 1 assay), FLPFFSNVTWFHAI studied as part of Spike glycoprotein from SARS-CoV2 (epitope ID 1074888, 1 publication, 2 assays), VQPTESIVRFPNITNLCPF studied as part of Spike glycoprotein from SARS-CoV2 (epitope ID 1075108, 1 publication, 1 assay) and YYRARAGEAANF studied as part of Replicase polyprotein 1ab from Other SARS (epitope ID 1075129, 1 publication, 1 assay).

Results Page: References Tab – Table Headers

Epitopes (16175) | Antigens (18) | Assays (46781) | Receptors (87269) | References (443)

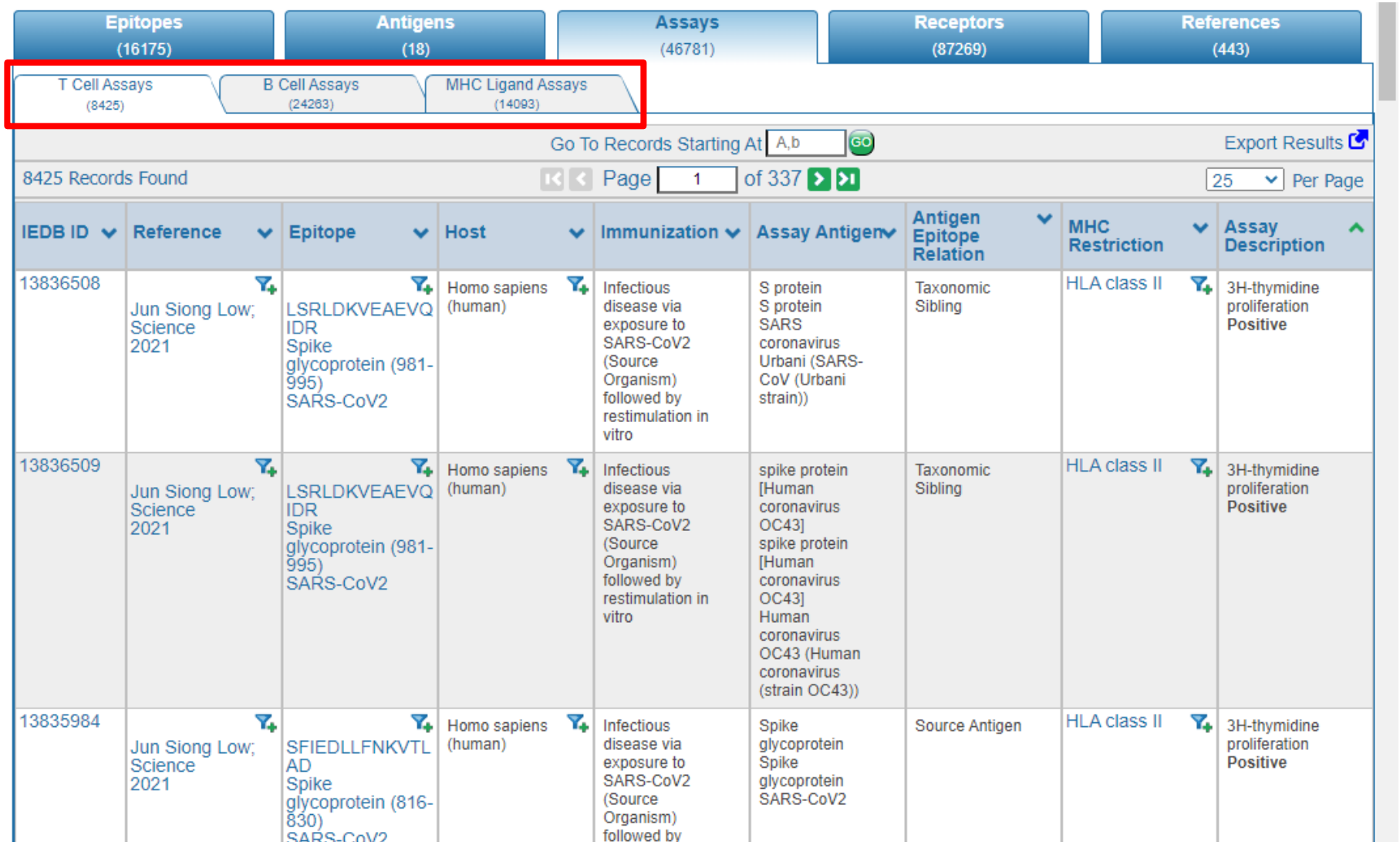
Go To Records Starting At 1982 GO | Export Results

443 Records Found | Page 1 of 18 | 25 Per Page

IEDB ID	PMID	Author	Title	Journal	Date
1040553	35404959	Alexandra C Willcox; Kevin Sung; Meghan E Garrett; Jared G Galloway; Jesse H Erasmus; Jennifer K Logue; David W Hawman; Helen Y Chu; Kim J Hasenkrug; Deborah H Fuller; Frederick A Matsen Iv; Julie Overbaugh	Detailed analysis of antibody responses to SARS-CoV-2 vaccination and infection in macaques.	PLoS Pathog	2022
1040001	35013235	Daichao Wu; Alexander Kolesnikov; Rui Yin; Johnathan D Guest; Ragul Gowthaman; Anton Shmelev; Yana Serdyuk; Dmitry V Dianov; Grigory A Efimov; Brian G Pierce; Roy A Mariuzza	Structural assessment of HLA-A2-restricted SARS-CoV-2 spike epitopes recognized by public and private T-cell receptors.	Nat Commun	2022
1040227	3518637[illegible]	Jie Zhang; Dan Lu; Min Li; Maoshun Liu; Sijia Yao; Jianbo Zhan; William J Liu; George F Gao	A COVID-19 T-Cell Response Detection Method Based on a Newly Identified Human CD8$^+$ T Cell Epitope from SARS-CoV-2 - Hubei Province, China, 2021.	China CDC Wkly	2022
1040292	35235832	Quirin Hammer; Josefine Dunst; Wanda Christ; Francesca Picarazzi; Mareike Wendorff; Pouria Momayyezi; Oisín Huhn; Herman K Netskar; Kimia T Maleki; Marina García; Takuya Sekine; Ebba Sohlberg; Valerio Azzimato; Myriam Aouadi; Karolinska COVID-19 Study Group; Severe COVID-19 GWAS Group; Frauke Degenhardt; Andre Franke; Francesco Spallotta; Mattia Mori; Jakob Michaëlsson; Niklas K Björkström; Timo Rückert; Chiara Romagnani; Amir Horowitz; Jonas Klingström; Hans-Gustaf Ljunggren; Karl-Johan Malmberg	SARS-CoV-2 Nsp13 encodes for an HLA-E-stabilizing peptide that abrogates inhibition of NKG2A-expressing NK cells.	Cell Rep	2022
1040686	35486722	Franz-Josef Obermair; Florian Renoux; Sebastian Heer; Chloe H Lee; Nastassja Cereghetti; Marisa Loi; Giulia Maestri; Yannick Haldner; Robin Wuigk; Ohad	High-resolution profiling of MHC II peptide presentation capacity reveals SARS-CoV-2 CD4 T cell targets and mechanisms of immune escape.	Sci Adv	2022

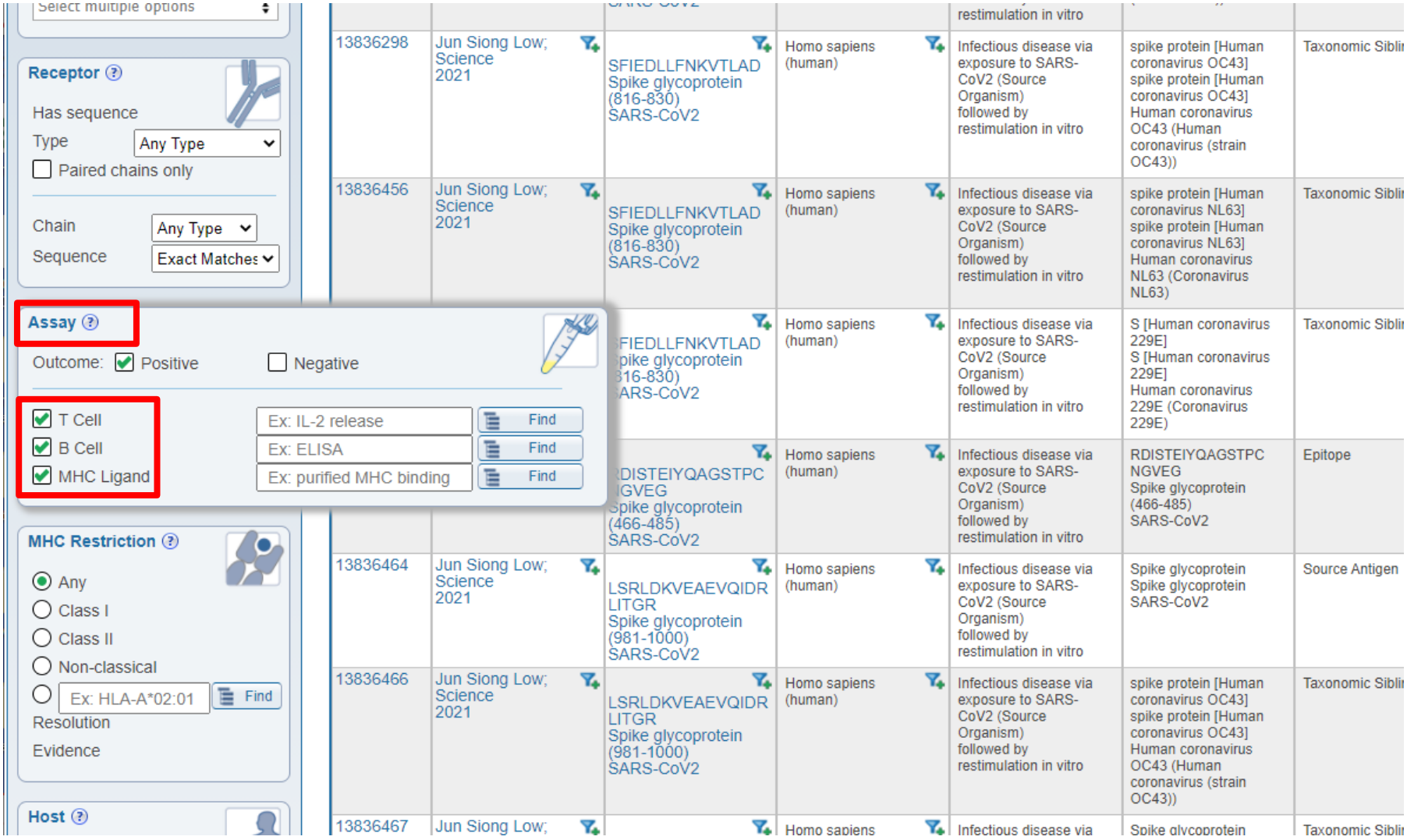
User Queries: How to see the differences between B and T cell responses for SARS-CoV2

Results Page: Assays Tab – Subtabs



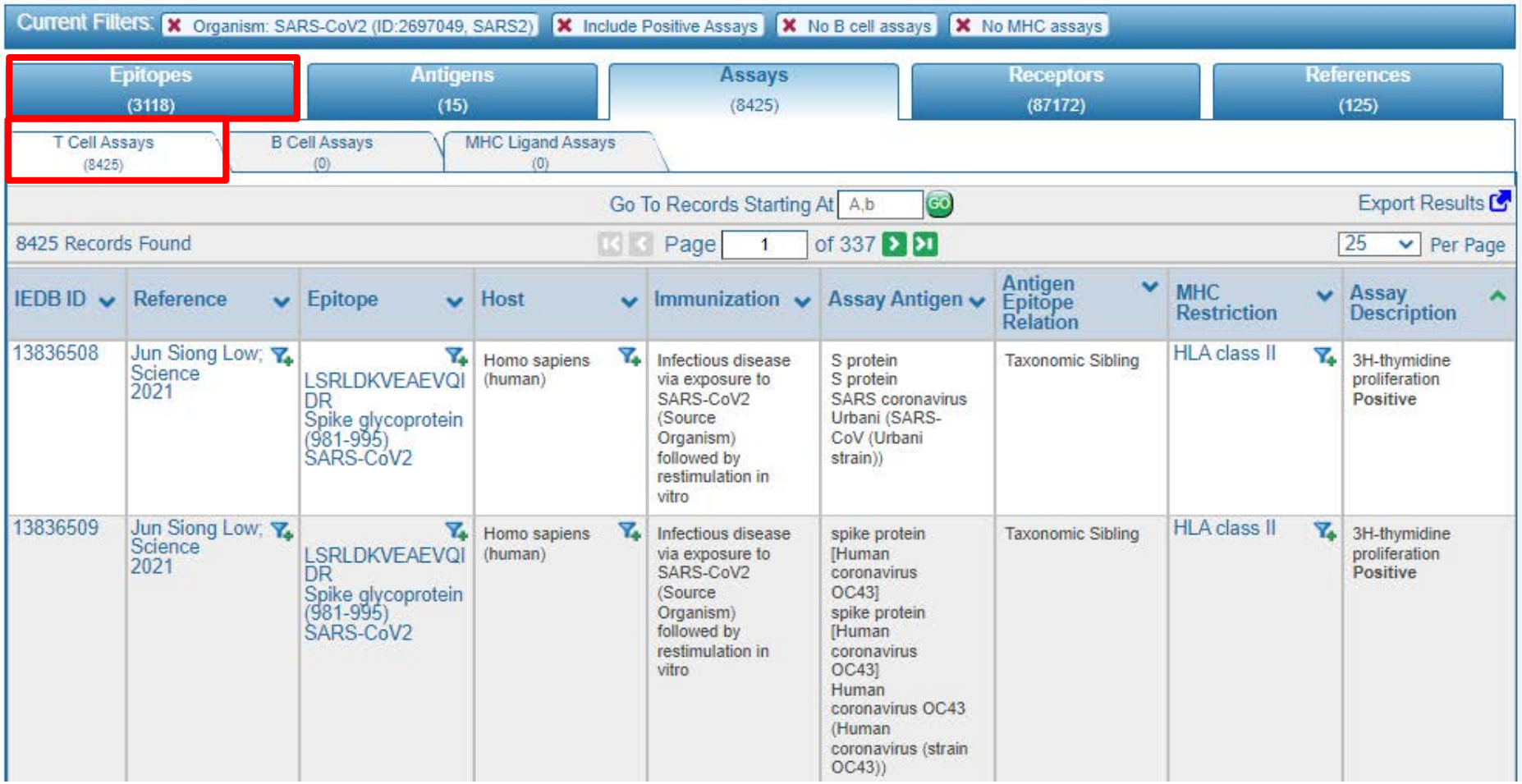
IEDB ID	Reference	Epitope	Host	Immunization	Assay Antigen	Antigen Epitope Relation	MHC Restriction	Assay Description
13836508	Jun Siong Low; Science 2021	LSRLDKVEAEVQIDR Spike glycoprotein (981-995) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by restimulation in vitro	S protein S protein SARS coronavirus Urbani (SARS-CoV (Urbani strain))	Taxonomic Sibling	HLA class II	3H-thymidine proliferation **Positive**
13836509	Jun Siong Low; Science 2021	LSRLDKVEAEVQIDR Spike glycoprotein (981-995) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by restimulation in vitro	spike protein [Human coronavirus OC43] spike protein [Human coronavirus OC43] Human coronavirus OC43 (Human coronavirus (strain OC43))	Taxonomic Sibling	HLA class II	3H-thymidine proliferation **Positive**
13835984	Jun Siong Low; Science 2021	SFIEDLLFNKVTLAD Spike glycoprotein (816-830) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by	Spike glycoprotein Spike glycoprotein SARS-CoV2	Source Antigen	HLA class II	3H-thymidine proliferation **Positive**

Results Page: Additional Filters - Differences Between B and T Cell Responses



Results Page: Additional Filters - Differences Between B and T Cell Responses

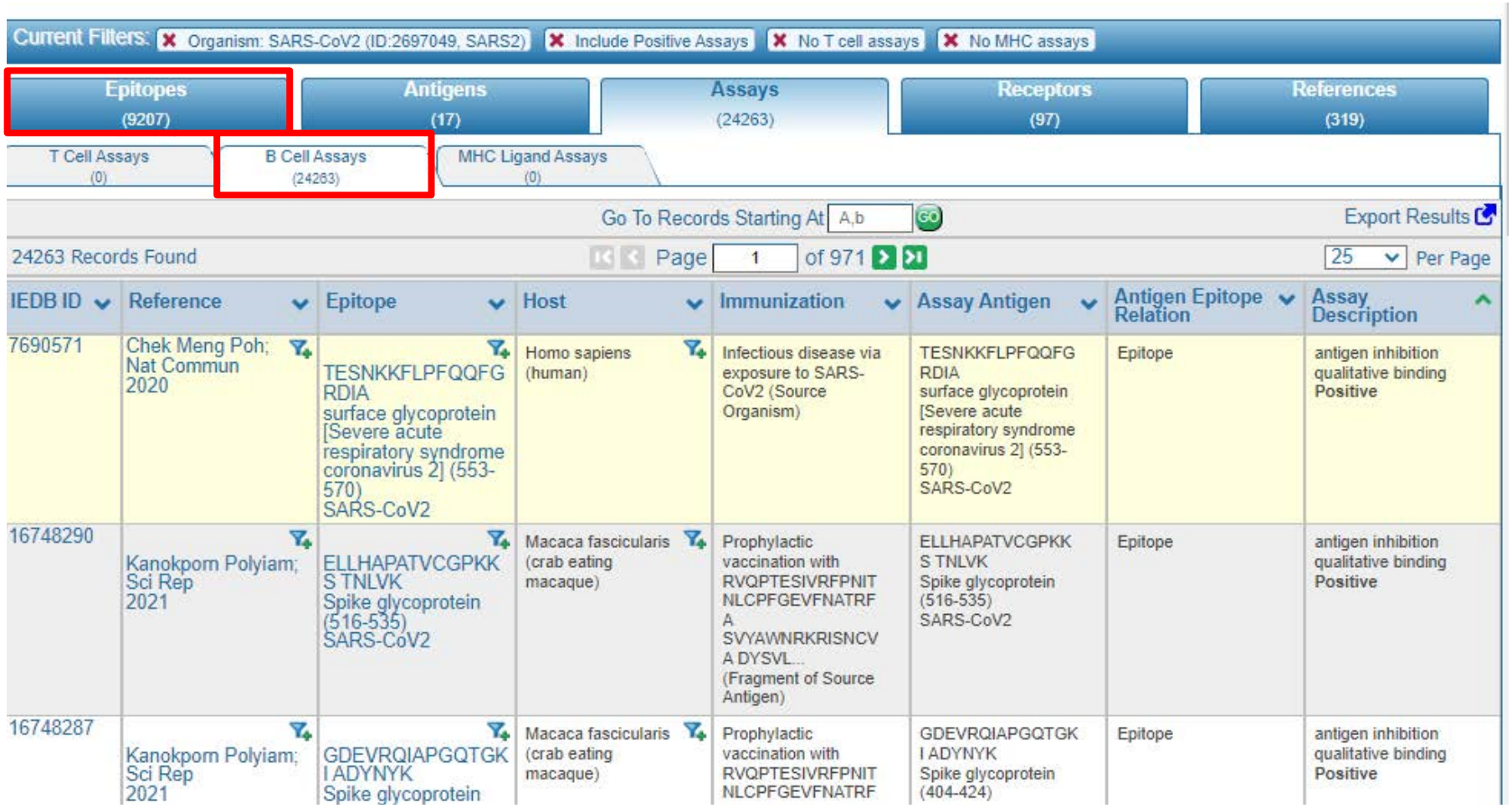
T cell assays only = T cell epitopes (3,118 epitopes)



IEDB ID	Reference	Epitope	Host	Immunization	Assay Antigen	Antigen Epitope Relation	MHC Restriction	Assay Description
13836508	Jun Siong Low; Science 2021	LSRLDKVEAEVQIDR Spike glycoprotein (981-995) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by restimulation in vitro	S protein S protein SARS coronavirus Urbani (SARS-CoV (Urbani strain))	Taxonomic Sibling	HLA class II	3H-thymidine proliferation **Positive**
13836509	Jun Siong Low; Science 2021	LSRLDKVEAEVQIDR Spike glycoprotein (981-995) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism) followed by restimulation in vitro	spike protein [Human coronavirus OC43] spike protein [Human coronavirus OC43] Human coronavirus OC43 (Human coronavirus (strain OC43))	Taxonomic Sibling	HLA class II	3H-thymidine proliferation **Positive**

Results Page: Additional Filters - Differences Between B and T Cell Responses

B cell assays only = B cell epitopes (9,207 epitopes)



Current Filters: Organism: SARS-CoV2 (ID:2697049, SARS2) | Include Positive Assays | No T cell assays | No MHC assays

Epitopes (9207) | Antigens (17) | Assays (24263) | Receptors (97) | References (319)

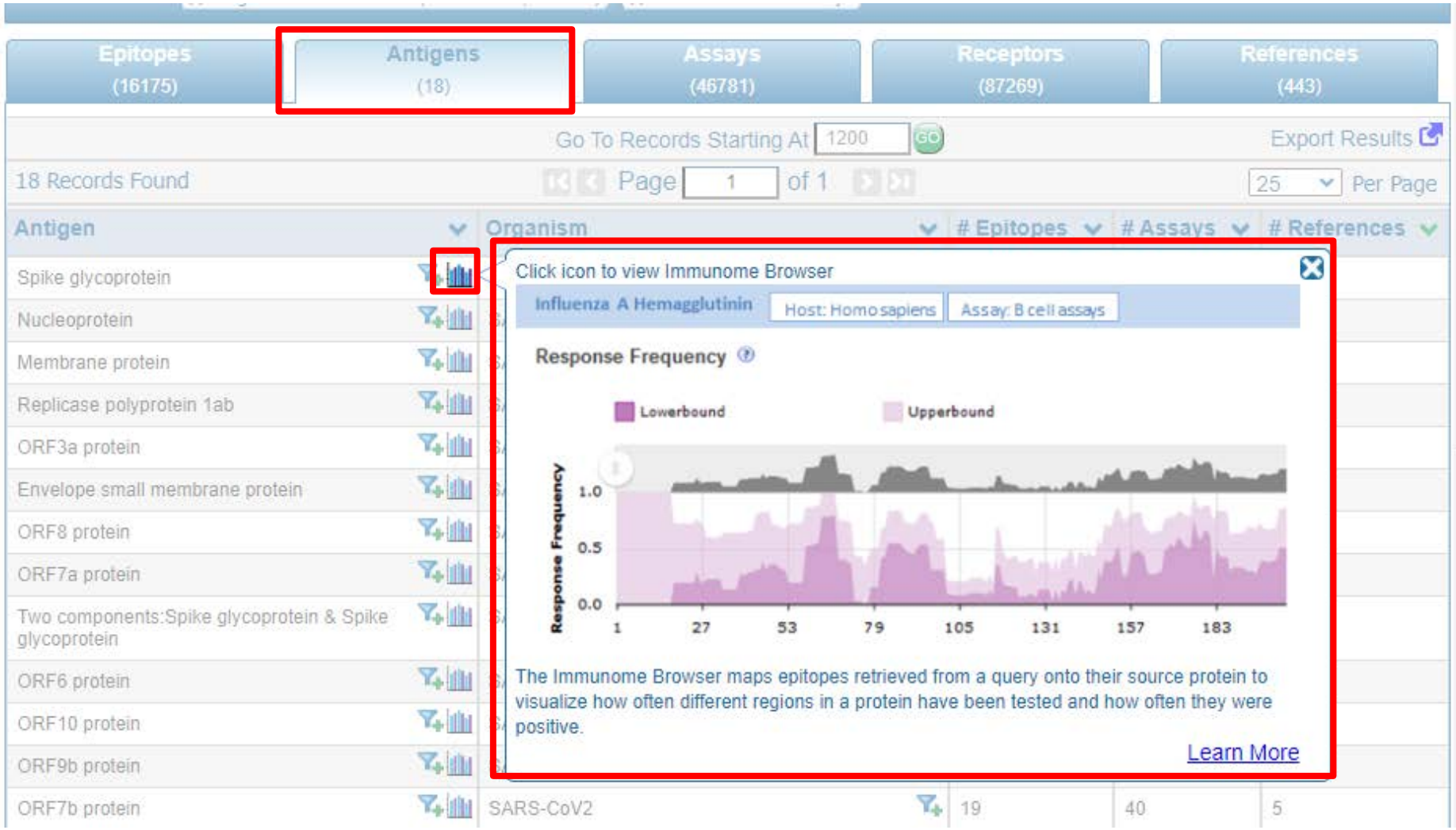
T Cell Assays (0) | B Cell Assays (24263) | MHC Ligand Assays (0)

Go To Records Starting At A,b GO | Export Results

24263 Records Found | Page 1 of 971 | 25 Per Page

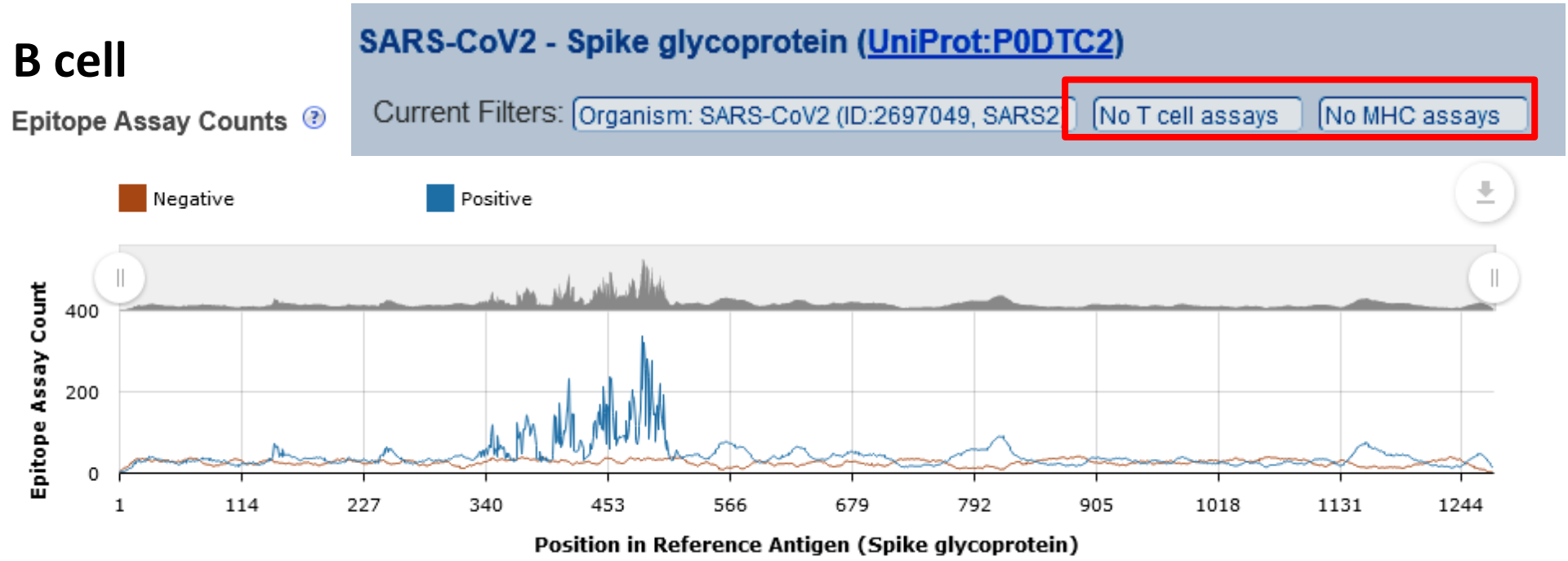
IEDB ID	Reference	Epitope	Host	Immunization	Assay Antigen	Antigen Epitope Relation	Assay Description
7690571	Chek Meng Poh; Nat Commun 2020	TESNKKFLPFQQFG RDIA surface glycoprotein [Severe acute respiratory syndrome coronavirus 2] (553-570) SARS-CoV2	Homo sapiens (human)	Infectious disease via exposure to SARS-CoV2 (Source Organism)	TESNKKFLPFQQFG RDIA surface glycoprotein [Severe acute respiratory syndrome coronavirus 2] (553-570) SARS-CoV2	Epitope	antigen inhibition qualitative binding **Positive**
16748290	Kanokporn Polyiam; Sci Rep 2021	ELLHAPATVCGPKK S TNLVK Spike glycoprotein (516-535) SARS-CoV2	Macaca fascicularis (crab eating macaque)	Prophylactic vaccination with RVQPTESIVRFPNIT NLCPFGEVFNATRF A SVYAWNRKRISNCV A DYSVL... (Fragment of Source Antigen)	ELLHAPATVCGPKK S TNLVK Spike glycoprotein (516-535) SARS-CoV2	Epitope	antigen inhibition qualitative binding **Positive**
16748287	Kanokporn Polyiam; Sci Rep 2021	GDEVRQIAPGQTGK I ADYNYK Spike glycoprotein	Macaca fascicularis (crab eating macaque)	Prophylactic vaccination with RVQPTESIVRFPNIT NLCPFGEVFNATRF	GDEVRQIAPGQTGK I ADYNYK Spike glycoprotein (404-424)	Epitope	antigen inhibition qualitative binding **Positive**

User Queries: How to see the differences between B and T cell responses **Immunome Browser**

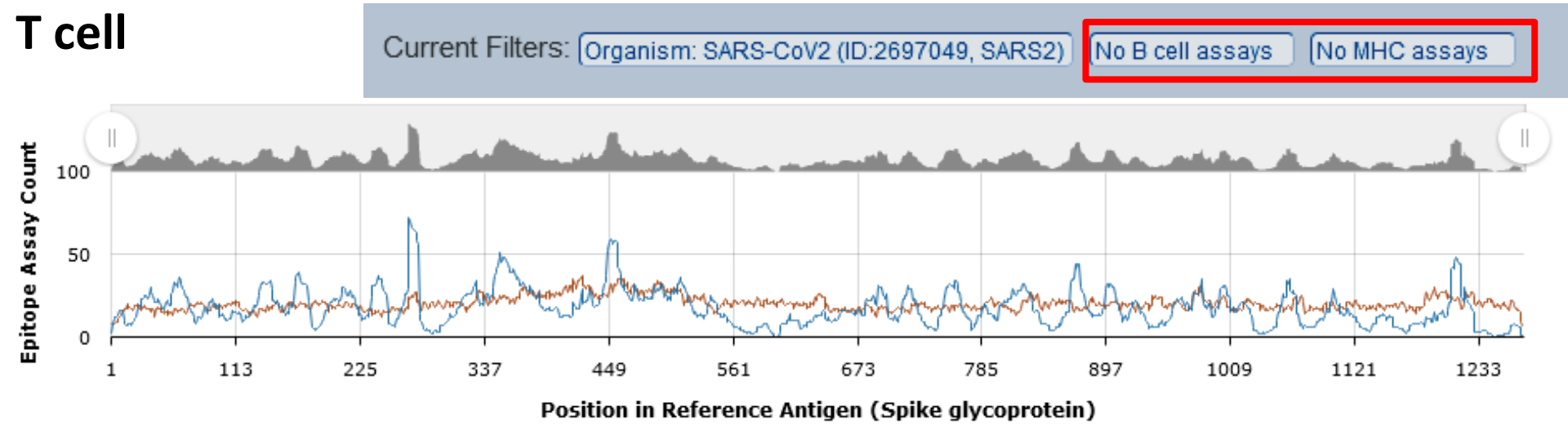


User Queries: How to see the differences between B and T cell responses

B cell

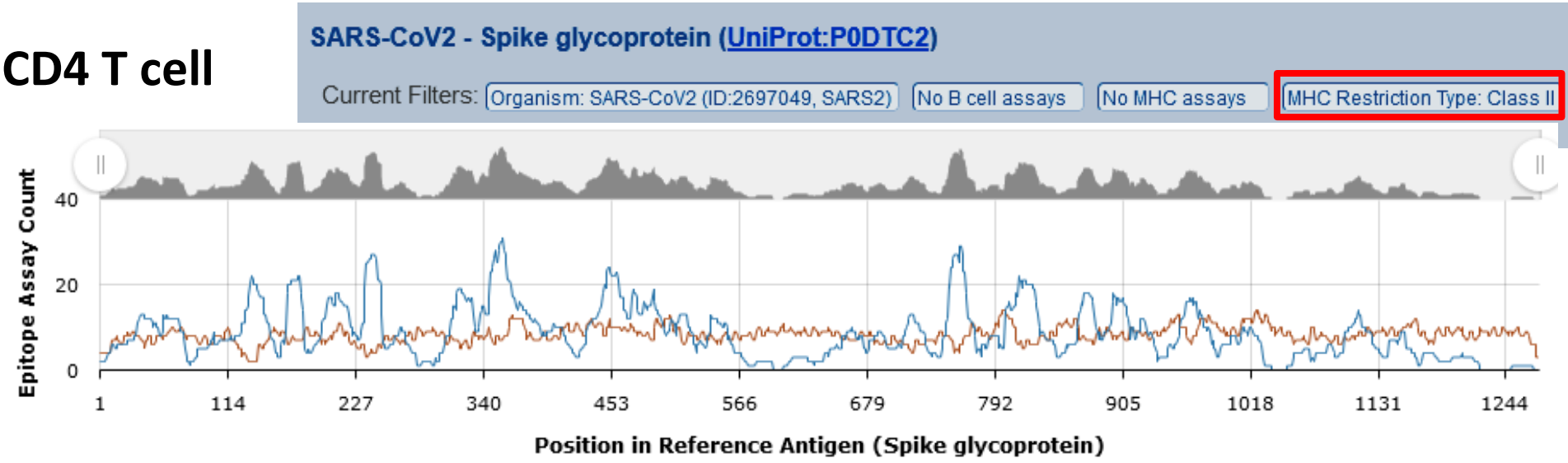


T cell

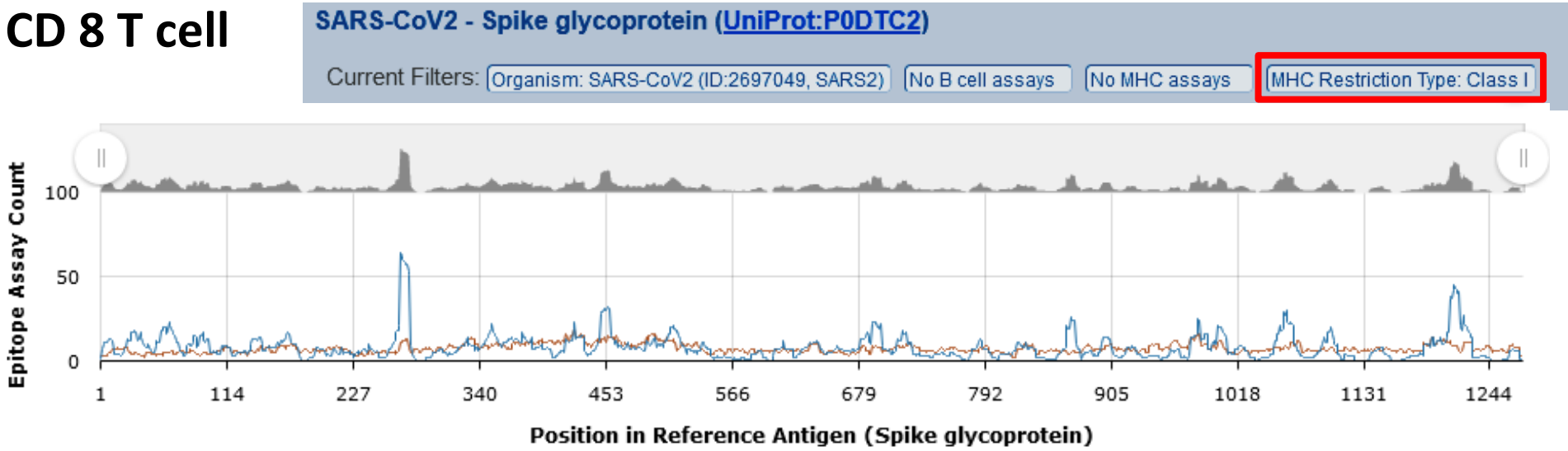


User Queries: How to see the differences between CD4 and CD8 T cell responses

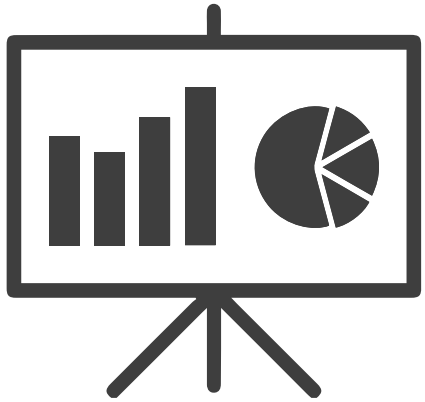
CD4 T cell



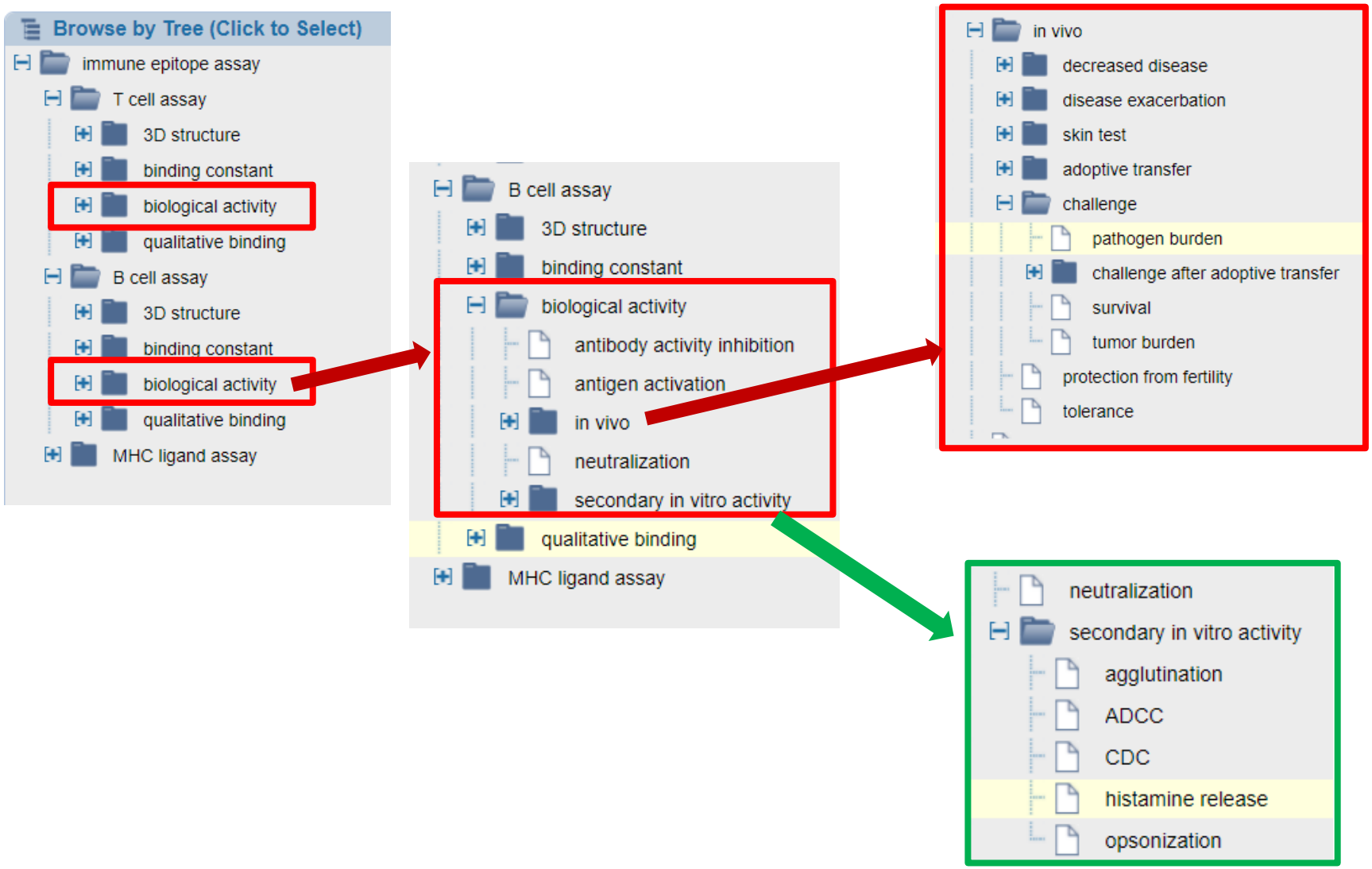
CD 8 T cell



Additional Slides



User Queries: How can we assess the protective capability of the epitopes of the database?



Exports – Epitope Source Antigen

Source protein isoform of epitope, author specified, 100% identical

Reference proteome source protein of epitope, groups all same proteins, not 100% identical

Epitope Antigen Name	Epitope Antigen IRI	Epitope Parent Protein	Epitope Parent Protein IRI
polyprotein	http://www.ncbi.nlm.nih.gov/protein/ABR25251.1	sp|P27958|POLG_HCVH Genome polyprotein OS=Hepatitis C virus genotype 1a (isolate H)	http://www.uniprot.org/uniprot/P27958
polyprotein	http://www.ncbi.nlm.nih.gov/protein/ABR25251.1	sp|P27958|POLG_HCVH Genome polyprotein OS=Hepatitis C virus genotype 1a (isolate H)	http://www.uniprot.org/uniprot/P27958
NP	http://www.ncbi.nlm.nih.gov/protein/Q91UL1	sp|P03466|NCAP_I34A1 Nucleoprotein OS=Influenza A virus (strain A/Puerto Rico/8/1934 H1N1)	http://www.uniprot.org/uniprot/P03466
60S ribosomal protein L28 isoform 2	http://www.ncbi.nlm.nih.gov/protein/NP_000982.2	sp|P46779|RL28_HUMAN 60S ribosomal protein L28 OS=Homo sapiens OX=9606 GN=RPL28 PE=1 SV=3	http://www.uniprot.org/uniprot/P46779
polyprotein	http://www.ncbi.nlm.nih.gov/protein/ABY67667.1	sp|P27958|POLG_HCVH Genome polyprotein OS=Hepatitis C virus genotype 1a (isolate H)	http://www.uniprot.org/uniprot/P27958
60S ribosomal protein L8	http://www.ncbi.nlm.nih.gov/protein/NP_000964.1	sp|P62917|RL8_HUMAN 60S ribosomal protein L8 OS=Homo sapiens OX=9606 GN=RPL8 PE=1 SV=2	http://www.uniprot.org/uniprot/P62917
K1 glycoprotein	http://www.ncbi.nlm.nih.gov/protein/AAT44989.1	sp|Q2HRD5|K1_HHV8P Protein K1 OS=Human herpesvirus 8 type P (isolate GK18) OX=868565	http://www.uniprot.org/uniprot/Q2HRD5
K1 glycoprotein [Human herpesvirus 8]	http://www.ncbi.nlm.nih.gov/protein/AAT44977.1	sp|Q2HRD5|K1_HHV8P Protein K1 OS=Human herpesvirus 8 type P (isolate GK18) OX=868565	http://www.uniprot.org/uniprot/Q2HRD5
alpha-actin	http://www.ncbi.nlm.nih.gov/protein/AAA51577.1	sp|P62736|ACTA_HUMAN Actin, aortic smooth muscle OS=Homo sapiens OX=9606 GN=ACTA2 PE=1	http://www.uniprot.org/uniprot/P62736
cytochrome c oxidase I	https://ontology.iedb.org/ontology/ONTIE_0002983	sp|P00395|COX1_HUMAN Cytochrome c oxidase subunit 1 OS=Homo sapiens OX=9606 GN=MT-CO1	http://www.uniprot.org/uniprot/P00395
gag protein	http://www.ncbi.nlm.nih.gov/protein/AAX81417.1	sp|P03349|GAG_HV1A2 Gag polyprotein OS=Human immunodeficiency virus type 1 group M subtype B (isolate ARV2/SF2) OX=11685 GN=gag PE=1 SV=3	http://www.uniprot.org/uniprot/P03349

Exports – Epitope Source Organism

Source organism of epitope, author specified

Reference proteome species of epitope, groups all same

Epitope Organism Name	Epitope Organism IRI	Epitope Parent Organism	Epitope Parent Organism IRI
Hepacivirus C	http://purl.obolibrary.org/obo/NCBITaxon_11103	Hepacivirus C	http://purl.obolibrary.org/obo/NCBITaxon_11103
Hepacivirus C	http://purl.obolibrary.org/obo/NCBITaxon_11103	Hepacivirus C	http://purl.obolibrary.org/obo/NCBITaxon_11103
Influenza A virus (A/X-31(H3N2))	http://purl.obolibrary.org/obo/NCBITaxon_132504	Influenza A virus	http://purl.obolibrary.org/obo/NCBITaxon_11320
Homo sapiens	http://purl.obolibrary.org/obo/NCBITaxon_9606	Homo sapiens	http://purl.obolibrary.org/obo/NCBITaxon_9606
Hepacivirus C	http://purl.obolibrary.org/obo/NCBITaxon_11103	Hepacivirus C	http://purl.obolibrary.org/obo/NCBITaxon_11103
Homo sapiens	http://purl.obolibrary.org/obo/NCBITaxon_9606	Homo sapiens	http://purl.obolibrary.org/obo/NCBITaxon_9606
Human gammaherpesvirus 8	http://purl.obolibrary.org/obo/NCBITaxon_37296	Human gammaherpesvirus 8	http://purl.obolibrary.org/obo/NCBITaxon_37296
Human gammaherpesvirus 8	http://purl.obolibrary.org/obo/NCBITaxon_37296	Human gammaherpesvirus 8	http://purl.obolibrary.org/obo/NCBITaxon_37296
Homo sapiens	http://purl.obolibrary.org/obo/NCBITaxon_9606	Homo sapiens	http://purl.obolibrary.org/obo/NCBITaxon_9606
Homo sapiens	http://purl.obolibrary.org/obo/NCBITaxon_9606	Homo sapiens	http://purl.obolibrary.org/obo/NCBITaxon_9606
Human immunodeficiency virus 1	http://purl.obolibrary.org/obo/NCBITaxon_11676	Human immunodeficiency virus 1	http://purl.obolibrary.org/obo/NCBITaxon_11676

Exports – Assay Types

Top Header row = Field Group (Reference, Epitope, etc.)
2nd Header Row = Field (terms may repeat)

Separate method and assay group columns allow sorting

IRI is linked to ontology term for assay (OBI ontology)

Assay	Assay	Assay	Assay	Assay	Assay	Assay	Assay
Location of assay data in the manuscript	Method/Technique	Assay Group	Units	Assay Type IRI	Qualitative Measure	Measurement Inequality	Quantitative measurement
Fig. 4A	lysate MHC/direct/radioactivity	qualitative binding		http://purl.obolibrary.org/obo/OBI_0001556	Positive		
Figure 4	cellular MHC/direct/fluorescence	qualitative binding		http://purl.obolibrary.org/obo/OBI_0001606	Positive		
Figure 4	cellular MHC/direct/fluorescence	qualitative binding		http://purl.obolibrary.org/obo/OBI_0001606	Positive		
Figures 2 and 5, table III	cellular MHC/direct/fluorescence	half life	min	http://purl.obolibrary.org/obo/OBI_0001559	Positive		2520
Figures 2 and 5, table III	cellular MHC/direct/fluorescence	half life	min	http://purl.obolibrary.org/obo/OBI_0001559	Positive		2220
	purified MHC/direct/fluorescence	dissociation constant KD (~EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001543	Positive-Low	>	5000
Figure 4 and table II	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive		5000
Figure 4 and table II	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive		7000
Figure 4	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive-High	=	4000
Figure 4	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive-High	=	3000
Figures 2 and 4	cellular MHC/direct/fluorescence	qualitative binding		http://purl.obolibrary.org/obo/OBI_0001606	Positive-High		
Figure 2	cellular MHC/direct/fluorescence	qualitative binding		http://purl.obolibrary.org/obo/OBI_0001606	Positive-High		
Figure 2	cellular MHC/direct/fluorescence	qualitative binding		http://purl.obolibrary.org/obo/OBI_0001606	Positive-High		
Figure 2	cellular MHC/direct/fluorescence	qualitative binding		http://purl.obolibrary.org/obo/OBI_0001606	Positive-Low		
Figure 2	cellular MHC/direct/fluorescence	qualitative binding		http://purl.obolibrary.org/obo/OBI_0001606	Positive-High		
Figure 7 and Tables 1, 2, ar	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive-Low	=	94000
Figure 7 and Tables 1, 2, ar	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive-Low	=	136000
Figure 7 and Tables 1, 2, ar	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive-Low	=	132000
Figure 7 and Tables 1, 2, 3,	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive-Interm	=	43000
Figure 7 and Tables 1, 2, 3,	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive-High	=	9000
Figure 7 and Tables 1, 2, ar	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive-Low	=	77000
Table 2	cellular MHC/direct/fluorescence	half maximal effective concentration (EC50)	nM	http://purl.obolibrary.org/obo/OBI_0001561	Positive-High	=	16000

Results Page: Discontinuous Epitopes

B cell assays only = B cell epitopes

Epitopes (4347) | Antigens (13) | Assays (9492) | Receptors (27) | References (149)

Go To Records Starting At 1200 GO Export Results

4347 Records Found Page 1 of 174 25 Per Page

Details	Epitope	Antigen	Organism	# References	# Assays
1336251	E484	Spike glycoprotein	SARS-CoV2	4	12
1338787	N501	Spike glycoprotein	SARS-CoV2	4	11
1069378	ECDIPIGAGICASYQ	Spike glycoprotein	SARS-CoV2	3	4
1070803	KPSKRSFIEDLLFNK	Spike glycoprotein	SARS-CoV2	3	5
1073281	TESNKKFLPFQQFGRDIA	Spike glycoprotein	SARS-CoV2	3	4
1310239	R346, N440, L441, K444, V445, G446, N448, Y449, Q4...	Spike glycoprotein	SARS-CoV2	3	19
1310265	AIVLQLPQGTTLPKG	Nucleoprotein	SARS-CoV2	3	6
1310304	CASYQTQTNSPRRAR	Spike glycoprotein	SARS-CoV2	3	6
1313381	QRVAGDSGFAAYSRY	Membrane protein	SARS-CoV2	3	4
1314086	F486, N487	Spike glycoprotein	SARS-CoV2	3	13
1316945	FSQILPDPSKPSKRSFIE	Spike glycoprotein	SARS-CoV2	3	5
1335914	E484	Spike glycoprotein	SARS-CoV2	3	9
1338780	K417	Spike glycoprotein	SARS-CoV2	3	6
1340666	EPIYDEPTTTTSVPL	ORF3a protein	SARS-CoV2	3	6
5406	AVKLQNNELSPVALR	Replicase polyprotein 1ab	SARS-CoV2	2	4

User Query: What protein are B cell epitope residues in reference to?

Epitope		
Epitope ID	1314086	IEDB_epitope:1314086
Chemical Type	Discontinuous peptide	
Source Name	surface glycoprotein [Severe acute respiratory syndrome coronavirus 2]	GenPept:QHD43416.1
Source Organism	SARS-CoV2	NCBITaxon:2697049
Discontinuous Residues	F486, N487	

Epitope Reference Details		
Epitope Structure Defines	Partial Epitope	
Epitope Name	Epitope of COV2-2196 on SARS-CoV-2	
Reference Region	F486, N487	
Location of Data in Reference	Figure 3	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