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Supplementary File

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Appendix 1. *SARS-CoV-2* Developed Vaccines (Up to 20th March 2021) [a]

Type of Vaccine	Name	Administration	Sponsor/Manufacturer	Clinical Phase	Extra Details
mRNA-based vaccine	BNT162b2	IM, Days 1 and 22	Pfizer BioNTech	Approved	Lipid nanoparticle (LNP)-encapsulated mRNA-based vaccine encodes full-length, prefusion stabilized spike (S) protein of *SARS-CoV-2*
	mRNA-1273	IM, Days 1 and 29	National Institute of Allergy and Infectious Diseases (NIAID) in collaboration with ModernaTX, Inc.	Phase III	
	mRNA-1283		ModernaTX, Inc.	Approved	
	CVnCoV	Days 1 and 29	CureVac AG	Phase III	
	LUNAR-COV19 (ARCT-021)		Arcturus Therapeutics and Duke-NUS Medical School	Phase II	This vaccine is comprised of a lipid-mediated delivery system called Lipid-enabled and Unlocked Nucleomonomer Agent modified RNA (LUNAR).
	ARCoV		Academy of Military Medical Sciences, Suzhou Abogen Biosciences and Walvax Biotechnology	Phase II	
	ChulaCov19		Chula Vaccine Research Center	Phase I	
	Unnamed *COVID-19*mRNA vaccine		Sanofi in partnership with Translate Bio.	Phase I/II	
	Unnamed mRNA vaccine		Yunnan Walvax Biotechnology Co., Ltd., Shulan (Hangzhou) Hospital, Center for Disease Control and Prevention of Guangxi Zhuang Autonomous Region	Phase I	
	CoV2 SAM (LNP)		GlaxoSmithKline	Phase I	The CoV2 SAM (LNP) vaccine is a self-amplifying mRNA (SAM) lipid

					nanoparticle (LNP) platform with *COVID-19* Spike antigen.
	PTX-COVID19-B		Providence Therapeutics Holdings Inc.	Phase I	
DNA-based vaccine	ZyCoV-D	Skin injection (skin patch), Days 1,29, 57	Zydus Cadila	Phase III	
	INO-4800	ID injection followed by EP Single dose/ Day 0 and Week 4	Inovio Pharmaceuticals	Phase III	
		ID injection followed by EP Day 0 and Week 4	International Vaccine Institute	Phase III	Plasmid pGX9501 encodes full length of *COVID-19*Spike glycoprotein
	bacTRL-Spike-1	Orally, Single dose	Inovio Pharmaceuticals	Phase I	Contains bacterial medium of live Bifidobacterium longum, which has been engineered to deliver plasmids containing synthetic DNA encoding spike protein from *COVID-19*
	GX-19	IM (via EP), Day 0 and 29	Genexine, Inc.	Phase I/II	Expressing *COVID-19*S-protein antigen
	AG0301-COVID19	IM, Day 1, 14	AnGes, Inc.	Phase II/ III	
	GLS-5310		GeneOne Life Science	Phase I/II	GLS-5310 is a DNA vaccine encoding the S protein and a second antigenic target of *SARS-CoV-2*
	COVID-eVax		Takis Biotech and Rottapharm Biotech	Phase I/II	A device employment an electric pulse to convey DNA through the skin to form S proteins.
	Covigenix VAX-001.		Entos Pharmaceuticals	Phase I	Gene of nucleocapsid
	Symvivo	Oral	Symvivo	Phase I	The DNA is inserted into harmless bacteria, (bacteria into a pill).
	CORVax12		OncoSec Immunotherapies	Phase I	The vaccine comprises of a DNA, encodes both the S protein and IL-12. This interleukin might possibly upgrade the immune system's capacity to form antibodies against the spike protein.
	COVIGEN	Skin	BioNet-Asia and Australia-based Technovalia		Investigators have created a needle free DNA vaccine. The dosage is loaded into a device and shot straightforwardly into cell tissue through a fly spray.
RNA vaccine	HGC019		Gennova Biopharmaceuticals in India and Seattle-based HDT Bio	Phase I/II	
	BNT162a1 BNT162b1 BNT162b2 BNT162c2	IM, Single-dose or Prime/Boost	Biontech SE BioNTech RNA Pharmaceuticals GmbH	Phase I/II	4 different *COVID-19*RNA vaccine
	BNT162b3	IM, Prime/Boost	BioNTech RNA Pharmaceuticals GmbH	Phase I/II	

	LNP-nCoVsaRNA		Imperial College London, Morningside Ventures	Phase I/II	Contain *COVID-19* S protein self-amplifying RNA packaged into tiny droplets of fat.
Vectored-based vaccine	Ad5- nCoV	IM, Days 1 and 22	Sputnik V (Gam-Covid-Vac) Gamaleya Research Institute	Phase III/approved	A combination of two adenoviruses Ad5 and Ad26.
		IM, Two doses	Convidecia, CanSino Biologics Inc.,	Phase III	
		Orally, Days 1 and 29	Vaxart	Phase I	
		IM, Single dose	Institute of Biotechnology, Academy of Military Medical Sciences, PLA of China	Phase II	
			ImmunityBio	Phase I	hAd5-S-Fusion+N-ETSD: This is an engineered the Ad5 virus to carry genes for two genes of S and N proteins (nucleocapsid with an enhanced T-cell stimulation domain).
			Jiangsu Province Centers for Disease Control and Prevention	Phase I	The Unnamed Ad5 Vaccine - Jiangsu is created using a type 5 adenovirus backbone and incorporating viral sequences from *SARS-CoV-2*.
	AdCLD-CoV19		Cellid and LG Chem	Phase I	AdCLD-CoV19 is a replication-defective human adenovirus type 5/35 vector-based vaccine expressing the *COVID-19*S protein.
	NasoVAX	Nasal spray /1 dose	Altimmune	Phase II	Delivering the Ad5 adenovirus to the airway.
	Ad26.COV2.S	IM, Single dose	Janssen Vaccines & Prevention B.V.	Phase III/Approved	
	ChAdOx1 nCoV-19	IM, Days 1 and 29	AstraZeneca (Oxford, AZD1222, Covishield in India) University of Oxford	PhaseII /III Approved	
			University of Witwatersrand, South Africa	Phase I/II	
	TMV-083	Days 1 and 28	Institut Pasteur, Themis Bioscience GmbH, Coalition for Epidemic Preparedness Innovations	Phase I	Recombinant measles vector expressing a modified surface glycoprotein of *SARS-CoV-2*
	MVA-*SARS*-2-S	IM, Days 0 and 28	Universitätsklinikum Hamburg-Eppendorf	Phase I	Modified Vaccinia Ankara (MVA) vector expressing S protein
			Universitätsklinikum Hamburg-Eppendorf, German Center for Infection Research, Philipps	Phase I	MVA (Modified Vaccinia Ankara) contain genes of S and N protein

			University Marburg Medical Center, Ludwig-Maximilians - University of Munich		
	COH04S1		City of Hope Medical Center, National Cancer Institute	Phase I	A synthetic MVA based vaccine contains small pieces of DNA.
	GRAd-COV2	IM, Single dose	ReiThera Srl	Phase II/ III	Gorilla Adenovirus that encodes full length S protein
	BBV154	Nasal spray/ Single dose	Bharat Biotech		chimpanzee adenovirus-based vaccine
	NDV-HXP-S		Mahidol University, The Government Pharmaceutical Organization	Phase I	Newcastle Disease Virus (NDV) based vaccine contains S protein gene..
	Gritstone Vaccine	Nasal spray /drops into the nose	Gritstone Oncology	Phase I	Genes of a chimpanzee adenovirus contain a bit of DNA encodes the complete S, N and ORF3a. In expansion, an RNA particle with the same genetic informational was put in a shell.
	V591		Merck Sharp & Dohme Corp.	Phase I	Attenuated measles virus as a vector.
	V59،	'swish and swallow' oral protocol	Merck Sharp & Dohme Corp	Phase I	The V590 vaccine is composed of a recombinant vesicular stomatitis virus expressing *COVID-19*antigens.
	MV-014-212		Meissa Vaccines	Phase I	Respiratory syncytial virus (RSV) contains gene S protein.
	COVI-VAC	Intranasal	Codagenix, Inc	Phase I	
	DelNS1-nCoV-RBD LAIV		The University of Hong Kong	Phase I	Genetically engineered live attenuated influenza virus that expresses the RBD of spike protein.
Protein /recombinant Protein Vaccine	SCB-2019	IM	Clover Biopharmaceuticals AUS Pty Ltd	Phase II/ III	*COVID-19* Trimeric S Protein Subunit + CpG 1018 plus Alum/ AS03
		IM, Days 1 and 29 5, 15, 45 mcg	The University of Queensland	Phase I	*COVID-19*Sclamp antigen plus MF59
	Covax-19	Day 0, 14	Vaxine Pty Ltd		*COVID19* recombinant spike protein with Advax-SM adjuvant
			GeneCure Biotechnologies		
	CoVac-1	S.C., Single dose	University Hospital Tuebingen		*COVID-19HLA-DR* peptides, XS15 emulsified in Montanide ISA 51 VG
	NVX-CoV2373	IM, Day 0 and 21	Novavax	Phase III	*COVID-19rS* (prefusion protein) nanoparticle + Matrix-M
	AdimrSC-2f		Adimmune Corporation	Phase I	Recombinant RBD of *COVID-19*spike (S) protein
	ZF2001	IM, Day 0, 21 and 42	Anhui Zhifei Longcom and the Institute of Medical Biology at the Chinese Academy of Medical Sciences	Phase III	
	Soberana 2		Cuba's Finlay Vaccine Institute	Phase III	A vaccine contains a portion of S protein, intertwined to a standard tetanus vaccine to make it stable along with aluminum hydroxide as an adjuvant to boost the immune system.

	Abdala		Center for Genetic Engineering and Biotechnology of Cuba	Phase III	A piece of RBD.
	Mambisa	Nasal spray	Center for Genetic Engineering and Biotechnology of Cuba	Phase I	A bit of RBD, beside hepatitis B protein that fortifies the immune system.
	-		West China Hospital of Sichuan University	Phase II	Embeded the RBD region in a gene of virus.
	-		Taiwan-based vaccine maker Medigen	Phase II	A vaccine made of a combination of S proteins and an adjuvant from Dynavax
	COVAXX		New York-based COVAXX, a subsidiary of United Biomedical	Phase II	A vaccine containing parts of several viral proteins
	MVC-COV1901		Medigen Vaccine Biologics Corp.	Phase I/II	The MVC-COV1901 vaccine is comprised of S protein and two adjuvants, CpG 1018 and Aluminium.
	Unnamed		Sanofi Pasteur, GlaxoSmithKline	Phase II	Use of Sanofi's S-protein antigen (based on recombinant DNA technology in a baculovirus) along with GSKs proprietary adjuvant technology.
	Unnamed Recombinant Vaccine - Jiangsu		Jiangsu Province Centers for Disease Control and Prevention, West China Hospital	Phase I/II	Use of Sf9 insect cells to produce S protein.
	Unnamed Recombinant Vaccine - ZHONGYIANKE		Jiangsu Province Centers for Disease Control and Prevention, Academy of Military Medical Sciences, Academy of Military Sciences, PLA, ZHONGYIANKE Biotech Co, Ltd., LIAONINGMAOKANGYUAN Biotech Co, Ltd	Phase I/II	It is a recombinant vaccine produced in Chinese hamster ovary cells (CHO Cell).
	ReCOV		Jiangsu Rec-Biotechnology Co., Ltd.	Phase I	ReCOV is a recombinant protein two-component *COVID-19* vaccine made in Chinese hamster ovary cells.
	Soberana 1		Finlay Vaccine Institute, Cuba	Phase I/II	It contains a part of RBD along with two extra ingredients: proteins from a bacteria and aluminum hydroxide.
	SpyBiotech		SpyBiotech	Phase I/II	A vaccine composed of the hepatitis B proteins assembled into hollow shells that decorated with S protein.
	Shionogi		Shionogi in collaboration with National Institute of Infectious Diseases and Kyushu University	Phase I/II	
	EuCorVac-19		EuBiologics	Phase I/II	
	GBP510		University of Washington/ The South Korean vaccine company SK Bioscience	Phase I/II	
	NBP2001	Adjuvanted with alum (RBD 30μg/dose) Adjuvanted with alum (RBD 50μg/dose)	SK Bioscience Co., Ltd.	Phase I	

	VBI-2902a		VBI Vaccines	Phase I/II	A vaccine based on hollow, virus-like protein (VLP) shells that express modified glycoprotein of S protein .
	ABCoV2		PREVENT-nCoV consortium, a team of biotechnology companies and research laboratories	Phase I/II	
	KBP-*COVID-19*		Kentucky BioProcessing	Phase I/II	Use of tobacco plants as bioreactors to produce antigens from virus.
	HLA-DR peptides		University of Tübingen	Phase I	
	COVAC-2	IM/ Days 0 and 29	University of Saskatchewan, Government of Canada Government of Saskatchewan, Vaccine Formulation Institute, SEPPIC	Phase I/II	Combination of S1 and SWE adjuvant.
	Cov-Pars Razi	Nasal spray/IM	Razi Vaccine & Serum Research Institute	Phase I	.
	PittCoVacc	Skin patch	University of Pittsburgh	Preclinical	A skin patch tipped with 400 tiny needles made of sugar. Dissolving of needles cause to deliver virus proteins into the body.
	Nanocovax		Nanogen Pharmaceutical Biotechnology Joint Stock Company	Phase I/II	Nanocovax is a recombinant S protein vaccine along with aluminum phosphate adjuvant.
	AKS-452		University Medical Center Groningen, Akston Biosciences Corporation	Phase I/II	AKS-452 is a biologically engineered RBD-Fc fusion protein vaccine. It was designed to induce and/or augment antibody titers.
	TAK-919		Takeda	Phase I/II	
	Shingrix		Oklahoma Medical Research Foundation, University of Oklahoma	Phase I	A vaccine composed of the recombinant varicella zoster virus glycoprotein E antigen that is reconstituted using the adjuvant AS01B.
Peptide-based vaccine	EpiVacCorona	IM, Day 0 and 21-28	Federal Budgetary Research Institution State Research Center of Virology and Biotechnology "Vector"	Phase III	Chemically synthesized peptide antigens conjugated to a carrier protein and adsorbed on an aluminum-containing adjuvant (aluminum hydroxide)
VLP (virus-Like Particle)	UB-612	IM, Day 0 and 21 3.75 µg, 7.5 µg, 15 µg with/without adjuvant	Medicago	Phase III	Adjuvant: CpG 1018/ AS03
	*COVID-19*VLP Vaccine		Dr Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital, The Scientific and Technological Research Council of Turkey, MonitorCRO	Phase I	This is a virus-like particle vaccine that is adjuvanted with alum and CpGODN-K3
Lentiviral Vector System	*Coronavirus*-Like Particle	5x10^6 cells of LV-DC S.C.	Shenzhen Geno- Immune Medical Institute	Phase I/II	DC modified by lentivirus vectors expressing *Covid-19* minigene SMENP and immune modulatory genes.

		antigen-specific CTLs I.V.			CTL activated by lentivirus vectors expressing *Covid-19* minigene SMENP and immune modulatory genes.
	LV-SMENP-DC	5x10^ 6 cells S.C. Day 0, 14, and 28		Phase I/II	Genetically Modified aAPC Universal Vaccine: aAPCs (artificial antigen presenting cells) modified by lentivirus including immune modulatory genes and the viral minigenes
DC-ATA	*Covid-19*/ aAPC vaccine		Aivita Biomedical, Inc.	Phase IB-II	Autologous DC loaded with antigens from *SARS-CoV-2*
AV-*COVID-19*	Autologous dendritic cells (DC) loaded with *SARS-CoV-2* antigens	SC with or without additional GM-CSF	Aivita Biomedical, Inc., PT AIVITA Biomedika Indonesia, Indonesia Ministry of Health, National Institute of Health Research and Development, Ministry of Health Republic of Indonesia, Indonesia-MoH, Faculty of Medicine University of Diponegoro, Indonesia	Phase I/II	The vaccine is composed of autologous dendritic cells (DC) loaded with antigens from *COVID-19*.
Inactivated Virus	DC-ATA Inactivated *SARS-CoV-2*	50U/0.5ml, 100U/0.5ml, 150U/0.5ml Day 0,14 / Day 0,28	Chinese Academy of Medical Sciences	Phase III	
		600SU/0.5ml 1200 SU/0.5ml Day 0,14 / Day 0,28	Sinovac Research and Development Co., Ltd.	Phase III/Approved	CoronaVac (formerly PiCoVacc)
		300SU/ml, 600SU/ml, (1200SU/ml) day 0,28	Sinovac Research and Development Co., Ltd.		
		IM, Day 0 and 21	Butantan Institute/ Sinovac	Phase III	Adsorbed inactivated *SARS-CoV-2*
		IM, 600SU/0.5ml, Day 0, 14	Health Institutes of Turkey	Phase III	
		IM, Day 0, 21.	Laboratorio Elea Phoenix S.A./ BIBP	Phase III	
		Day 0, 21.	China National Biotec Group Company Limited	Phase III	
		Day 0,28	Chinese Academy of Medical Sciences	Phase I/II	
	Recombinat *SARS-CoV-2*	IM, Two/Three doses	Jiangsu Province Centers for Disease Control and Prevention	Phase I	
	BBIBP-CorV	IM/ Days 0 and 21	Beijing Institute of Biological Products/Sinopharm	Phase III/Approved	
	Wuhan vaccine		Wuhan Institute of Biological Products Sinopharm /	Phase III/Approved	
	Yunnan vaccine		Chinese Academy of Medical Sciences, West China Second University Hospital, Yunnan	Phase III	

			Center for Disease Control and Prevention		
	Covaxin (BBV152 A, B, C)	Days 0 and 28	Indian Council of Medical Research and the National Institute of Virology in collaboration with Bharat Biotech	Phase III	Covaxin is a whole-virion inactivated *COVID-19*vaccine formulated with a TLR 7/8 agonist molecule adsorbed to alum adjuvant.
	QazCovid		Research Institute for Biological Safety Problems / The central Asian nation of Kazakhstan	Phase III/ anticipating approval by March 2021.	
	ERUCOV-VAC		Health Institutes of Turkey, TC Erciyes University	Phase II	
	CoviVac		Chumakov Center at the Russian Academy of Sciences	Phase I/II / Approved in Russia for domestic use	
	VLA2001		Valneva Austria GmbH, National Institute for Health Research, United Kingdom	Phase I/II	VLA2001 is a whole virus inactivated *COVID-19*vaccine adjuvanted with cytosine phosphor-guanine (CpG) 1018 in combination with aluminium hydroxide.
	Unnamed Inactive Vaccine - Jiangsu		Beijing Minhai Biotechnology Co., Ltd, Shenzhen Kangtai Biological Products Co., LTD, Jiangsu Province Centers for Disease Control and Prevention	Phase I/II	
	COVIran Barekat		Shafa Pharmed Pars	Phase I	
	Fakhravac		Iran's Ministry of Defence	Phase I	
	Oral Polio Vaccine		Bandim Health Project, NeuroActiva, Inc., Biomed Industries, Inc., E-MO Biology Inc	Phase III	An attenuated strain of the virus vaccine that causes poliomyelitis
	IMM-101		Canadian Cancer Trials Group, Immodulon Therapeutics Ltd, BioCan Rx, Canadian Cancer Society Research Institute (CCSRI), ATGen Canada Inc, Canadian Centre for Applied Research in Cancer Control (ARCC)	Phase III	Heat-killed Mycobacterium obuense
	BACMUNE (MV130)	Oral spray	Inmunotek S.L., BioClever 2005 S.L.	Phase III	
	V-*SARS*	Oral in pill form	Immunitor LLC	Phase I/II	Heat-inactivated plasma of donors with *COVID-19*
	RUTI		Fundació Institut Germans Trias i Pujol	Phase NA	Purified and liposomed heat-inactivated Mycobacterium tuberculosis bacilli
BCG Vaccine		Intradermal, Intracutaneously Single-dose	Radboud University UMC Utrecht TASK Applied Science Universidad de Antioquia	Phase III/IV	

			Ain Shams University Hellenic Institute for the Study of Sepsis University of Campinas, Brazil Murdoch Childrens Research Institute Biomed Health Project, University of Southern Denmark Texas A&M University Assistance Publique - Hôpitaux de Paris Vakzine Projekt Management GmbH Hospital Universitario Dr. Jose E. Gonzalez Pere-Joan Cardona Fundació Institut Germans Trias i Pujol Harvard Medical School Tuberculosis Research Centre, India		
MMR vaccine	Attenuated Mycobacterium bovis	S.C.	Kasr El Aini Hospital	Phase III	

[a] Sources:

- Grifoni, A., et al., *A sequence homology and bioinformatic approach can predict candidate targets for immune responses to SARS-CoV-2.* Cell host & microbe, 2020.
- Ahmed, S.F., A.A. Quadeer, and M.R. McKay, *Preliminary identification of potential vaccine targets for the COVID-19 coronavirus (SARS-CoV-2) based on SARS-CoV immunological studies.* Viruses, 2020. **12**(3): p. 254.

Appendix 2. Databases related to prediction of B cell epitopes [a]

Name of database	Introduction
DiscoTope 2.0	Explicitly predicts discontinuous epitopes by combining the surface accessibility and spatial and amino acid statistics to differentiate between epitope and nonepitope sites.
PEPOP	web-server developed for the prediction of CBCEs, and uses the 3D coordinates of a protein for clustering the exposed sites of the Ag that might be related to conformational epitopes
(PEPOP 2.0)	Its improved version of PEPOP 2.0 is newly developed and showed potential for designing structural peptides to be detectable via the antibodies targeted for cognate antigens
SEPPA	as a CBCE predictor, looks for the local spatial context in the protein antigen surface and 3D characteristics of epitopes using a novel concept of a unit patch of residue triangle and spatial clustering coefficients
Bpredictor	Is an accurate random forest-based method that identifies CBCEs based on their 3D structures
ABCPred	As the first server for the prediction of continuous BCEs, has two main limitations: the small size of its data set and the use of random peptides as non-BCEs
BCPRED	Is a server that has been developed based on the support vector machine (SVM) approach
SVMTriP	Predicts linear antigenic epitopes based on the SVM technique, combining the tripeptide similarity and propensity scores
LBtope	Is the first server to use experimentally verified BCEs and non-BCEs from the IEDB database
CBtope	is an SVM-based predictor using a combination of traditional features of physicochemical profiles and sequence-derived inputs, including the composition and colocation of amino acids.
ABcheck	Provides the ability to evaluate the sequence of DNA sequences provided in the Kabat database. In this way, it is possible to identify sequencing and cloning errors in the sequence of antibodies.
AntiJen	A database contains antigen related epitope quantitative data
BCIPEP	Has comprehensive information about B-cell epitopes that have been experimentally proven. In addition, it has a tool for determining the map of epitopes on the sequence of antigens.
CED	Contains 293 reports of structural B cell epitopes that have been extracted from scientific texts, and the function of these epitopes has been well identified and defined.
Epitome	Contains information about all known interactions of antigen and antibody complexes and is a tool for identifying and recalling antigenic interactions in these structures.
IEDB	As of February 1, 2011, it had 79,230 peptide opiates. Provides information about the epitope sequence, the reference antigen, and the sequence existance
IMGT/IG	It has the structures of immunoglobulins and their interpreted sequences
HaptenDB	Provides comprehensive information on haptens, ways to stimulate safety against them, the level of specificity and cross-interaction of created antibodies, and the use of antibodies to make a diagnostic kit.
HIV Immunology	Contains a list of monoclonal and polyclonal responses to HIV proteomes. In addition, it has information about the changes and location of epitopes, mutations, structure, and biological effects of antibody response.
HCV Immunology	Contains a list of monoclonal and polyclonal responses to HCV proteomes. In addition, it has information about the changes and location of epitopes, mutations, structure, and biological effects of antibody response.
MMDB	The most complete source of crystallographic structures includes antibodies, TCR and HLA.
SACS	a summary of the crystal anti bodies structures Keep in it

[a] Sources:

- Fast, E. and B. Chen, *Potential T-cell and B-cell Epitopes of 2019-nCoV*. bioRxiv, 2020. doi: 10.1101/2020.02.19.955484
- Parvizpour S, Pourseif MM, Razmara J, Rafi MA, Omidi Y. Epitope-based vaccine design: a comprehensive overview of bioinformatics approaches. *Drug Discov Today*. 2020;25(6):1034-42. doi: 10.1016/j.drudis.2020.03.006. [PubMed: 32205198].

Appendix 3. Databases related to prediction of T cell epitopes

Name of database	Introduction
PCPS	has been developed for the prediction of proteasomal cleavage sites
TAPhunter	predicts TAP-binding peptides using a novel encoding scheme based on the representation of TAP peptide fragments and composition effects
NetMHCcons 1.1	is a server for the projection of any MHC-I binding peptides The server integrates three state-of-the-art predictors (NetMHC,NetMHCpan, and PickPocket) to find the most accurate predictions.
nHLAPred	provides accurate prediction by applying both the ANN- and QM-based methods.
EpiDOCK	uses homology modeling and molecular-docking approaches to predict the binding affinity of peptides to MHC-II molecules. This webserver was established using a structure-based algorithm that works by using docking score-based quantitative matrices (DS-QM)
INFepitope	A direct method has also been proposed for the prediction of T-helper epitopes. It is utilized to predict and design interferon-γ (IFN-γ)-inducing peptides, MHC-II binders or TCEs.
PREDIVAC	It has been established to forecast CD^{4+} TCEs, with substantial improvements over previous methods.
Allele Frequencies	Provides summaries of HLA abundance as well as polymorphism in cytokines.
AntiJen	Provides experimental and quantitative connection data of Peptides attached to TAP, MHC, Cell epitopes of B and T (In the previous table, its other efficiency is also mentioned)
dbMHC	Includes summaries of genetic organization of HLA regions, Synthesis of genetic sequences and tools for determining HLA type
dbMHC Anthropology	The abundance of alleles and individual haplotypes associated with large numbers of populations, nations, and geographical areas It can be extracted from it.
FRED	It has worked with information processing methods and is also able to evaluate predictive methods using experimental data.
HIV Immunology	It includes T cell epitopes that are CDs^{+8} and CDs^{+4}, as well as an epitope map of the HIV proteome.
IEDB	As of February 1, 2011, it had 79,230 peptide epitopes, providing information on the sequence of the epitope, its antigen, and its reference (the previous table also lists its other efficacy).
IMGT/HLA	It includes HLA aligned and interpreted sequences based on the World Health organization's naming method.
IMGT/TR	It contains information about the aligned and interpreted sequences of the T cell receptor.
JenPep	A database containing several types of data, including: B cell epitops, T-cell epitops and peptide-MHC-TR complexes.
MHCBN	Includes 20717 connecting peptides and 4022 unconnected peptides to MHC, 1053 peptides are non-binding to TAP and 1600 antigens.
MHC Haplotype Project	It contains data of MHP-related disease haplotypes along with complete genomic sequences, polymorphisms, and their ancestral relationships.
MotifScan	It includes conversion tables genotype, species, and subtype, as well as HLA-specific anchor sections.
PDB	Database containing protein structure, with structure viewing tools and with MHC / peptide / TCR combinations
SYFPEITHI	It allows you to carefully examine the epitopes that connect to the MHC and the specific anchor and specific support sections of the MHC.
BIMAS	Rank peptides based on the half-life of class 1 HLA molecules and using the tables in the scientific literature.

ELF	It is able to present maps of anchor motifs on HLA proteins and peptides and in connection with known epitopes from HIV and HCV epitopes databases.
ElliPro	Uses an upgraded version of the three-dimensional modeling program to predict and picturing of epitopes.
EpiToolKit	It has several predictive methods for MHC class 1 and 2 ligands and also able to study mutation effects on T cell epitopes.
EpiVax	It predicts category 1 and 2 epitopes, which are identified by a wide range of MHCs, as well as a variety of protected epitopes.
CTLpred	Processes CTL epitopes by combining connection prediction methods,
IEDB Binding ,MHC	Predicting peptide binding to MHC class 1 and class 2 and predicting epitopes T cell $CD8^+$ Based on the prediction of peptide and IEDB binding in MHC of proteosomic cleave and performs connects to TAP.
iMAPPP	It contains all the epitopes predicted by SYFPEITHI and FRAGPREDICT (software presented in the previous cases) or the molecular weight and peptide bonding and predicted MHC.
MHCPred	Considers the interaction of ligand and protein through energy calculations and provides the ability to predict peptide binding to TAP and MHC.
MHC2Pred	The predictor of epitopes is connected to a wide range of MHCs in MHCs ClassII
MMBPred	The predictor of epitopes is connected to a wide range of MHCs in MHCs Class1 and can also detect mutations that lead to a strong connection.
NetChop	Can predict the proteosomic and immuno proteosomic cleave sites using a nonlinear neural network
NetCTL	Predicts epitope using the weighted matrix method and the combination prediction of peptide and HLA binding proteosome cleave of carboxyl end and transfer efficiency by TAP
NetMHC	Predicts the connection of peptide to HLA using artificial neural networks
NetMHCIIpan 3.1	is an updated version of a quantitative method that can forecast the binding of peptides to MHC-II molecules in humans and mice. All the aforementioned T-helper epitope-predicting methods use an indirect scheme to predict MHC-II binder
PAProC	Provides human proteosomal cleavable sites
Pcleavage	Anticipates proteasomes cleavable positions in antigens
ProPred	Provides prediction of peptide binding to MHC class 2
ProPred-I	Provides the ability to connect the peptide to MHC class 1 with possibility and use of proteasome cutting filter
SYFPEITHI	Uses a frequency-based scoring system for each amino acid site to predict T-cell epitopes.
TAPPred	Represents prediction of attachment affinity of TAP proteins