

DRAFT landscape of COVID-19 candidate vaccines – 20 April 2020

5 candidate vaccines in clinical evaluation

Platform	Type of candidate vaccine	Developer	Coronavirus target	Current stage of clinical evaluation/regulatory status- Coronavirus candidate	Same platform for non-Coronavirus candidates
Non-Replicating Viral Vector	Adenovirus Type 5 Vector	CanSino Biological Inc./Beijing Institute of Biotechnology	COVID-19	Phase 2 ChiCTR2000031781 Phase 1 ChiCTR2000030906	Ebola
DNA	DNA plasmid vaccine Electroporation device	Inovio Pharmaceuticals	COVID-19	Phase 1 NCT04336410	Lassa, Nipah HIV Filovirus HPV Cancer indications Zika Hepatitis B
Inactivated	Inactivated	Beijing Institute of Biological Products/Wuhan Institute of Biological Products	COVID-19	Phase 1 ChiCTR2000031809	
Inactivated	Inactivated + alum	Sinovac	COVID-19	Phase 1	SARS
RNA	LNP-encapsulated mRNA	Moderna/NIAID	COVID-19	Phase 1 NCT04283461	multiple candidates

71 candidate vaccines in preclinical evaluation

Platform	Type of candidate vaccine	Developer	Coronavirus target	Current stage of clinical evaluation/regulatory status- Coronavirus candidate	Same platform for non-Coronavirus candidates
DNA	DNA with electroporation	Karolinska Institute / Cobra Biologics (OPENCORONA Project)	COVID-19	Pre-Clinical	
DNA	DNA plasmid vaccine	Osaka University/ AnGes/ Takara Bio	COVID-19	Pre-Clinical	

DISCLAIMER:

These landscape documents have been prepared by the World Health Organization (WHO) for information purposes only concerning the 2019-2020 global of the novel coronavirus. Inclusion of any particular product or entity in any of these landscape documents does not constitute, and shall not be deemed or construed as, any approval or endorsement by WHO of such product or entity (or any of its businesses or activities). While WHO takes reasonable steps to verify the accuracy of the information presented in these landscape documents, WHO does not make any (and hereby disclaims all) representations and warranties regarding the accuracy, completeness, fitness for a particular purpose (including any of the aforementioned purposes), quality, safety, efficacy, merchantability and/or non-infringement of any information provided in these landscape documents and/or of any of the products referenced therein. WHO also disclaims any and all liability or responsibility whatsoever for any death, disability, injury, suffering, loss, damage or other prejudice of any kind that may arise from or in connection with the procurement, distribution or use of any product included in any of these landscape documents.

DNA	DNA	Takis/Applied DNA Sciences/Evvivax	COVID-19	Pre-Clinical	
DNA	Plasmid DNA, Needle-Free Delivery	Immunomic Therapeutics, Inc./EpiVax, Inc./PharmaJet, Inc.	COVID-19	Pre-Clinical	SARS
DNA	DNA plasmid vaccine	Zydus Cadila	COVID-19	Pre-Clinical	
DNA	DNA vaccine	BioNet Asia	COVID-19	Pre-Clinical	
DNA	DNA vaccine	University of Waterloo	COVID-19	Pre-Clinical	
Inactivated	TBD	Osaka University/ BIKEN/ NIBIOHN	COVID-19	Pre-Clinical	
Inactivated	Inactivated + CpG 1018	Sinovac/Dynavax	COVID-19	Pre-Clinical	
Live Attenuated Virus	Deoptimized live attenuated vaccines	Codagenix/Serum Institute of India	COVID-19	Pre-Clinical	HAV, InfA, ZIKV, FMD, SIV, RSV, DENV
Non-Replicating Viral Vector	ChAdOx1	University of Oxford	COVID-19	Phase 1/2 (not yet recruiting) NCT04324606	MERS, influenza, TB, Chikungunya, Zika, MenB, plague
Non-Replicating Viral Vector	MVA encoded VLP	GeoVax/BravoVax	COVID-19	Pre-Clinical	LASV, EBOV, MARV, HIV
Non-Replicating Viral Vector	Ad26 (alone or with MVA boost)	Janssen Pharmaceutical Companies	COVID-19	Pre-Clinical	Ebola, HIV, RSV

DISCLAIMER:

These landscape documents have been prepared by the World Health Organization (WHO) for information purposes only concerning the 2019-2020 global of the novel coronavirus. Inclusion of any particular product or entity in any of these landscape documents does not constitute, and shall not be deemed or construed as, any approval or endorsement by WHO of such product or entity (or any of its businesses or activities). While WHO takes reasonable steps to verify the accuracy of the information presented in these landscape documents, WHO does not make any (and hereby disclaims all) representations and warranties regarding the accuracy, completeness, fitness for a particular purpose (including any of the aforementioned purposes), quality, safety, efficacy, merchantability and/or non-infringement of any information provided in these landscape documents and/or of any of the products referenced therein. WHO also disclaims any and all liability or responsibility whatsoever for any death, disability, injury, suffering, loss, damage or other prejudice of any kind that may arise from or in connection with the procurement, distribution or use of any product included in any of these landscape documents.

Non-Replicating Viral Vector	Replication defective Simian Adenovirus (GRAd) encoding SARS-CoV-2 S	ReiThera	COVID-19	Pre-Clinical	
Non-replicating viral vector	MVA-S encoded	DZIF – German Center for Infection Research	COVID-19	Pre-clinical	Many
Non-Replicating Viral Vector	adenovirus-based NasoVAX expressing SARS2-CoV spike protein	Altimmune	COVID-19	Pre-Clinical	influenza
Non-Replicating Viral Vector	Ad5 S (GREVAX™ platform)	Greffex	COVID-19	Pre-Clinical	MERS
Non-Replicating Viral Vector	Oral Vaccine platform	Vaxart	COVID-19	Pre-Clinical	InfA, CHIKV, LASV, NORV; EBOV, RVF, HBV, VEE
Non-Replicating Viral Vector	MVA expressing structural proteins	Centro Nacional Biotecnología (CNB-CSIC), Spain	COVID-19	Pre-Clinical	HIV, HCV, chikungunya, Ebola, zika, malaria, leishmania
Non-Replicating Viral Vector	Dendritic cell-based vaccine	University of Manitoba	COVID-19	Pre-Clinical	
Protein Subunit	Capsid-like Particle	AdaptVac (PREVENT-nCoV consortium)	COVID-19	Pre-Clinical	
Protein Subunit	Drosophila S2 insect cell expression system VLPs	ExpreS2ion	COVID-19	Pre-Clinical	
Protein Subunit	Peptide antigens formulated in lipid nanoparticle formulation	IMV Inc	COVID-19	Pre-Clinical	
Protein Subunit	S protein	WRAIR/USAMRIID	COVID-19	Pre-Clinical	

DISCLAIMER:

These landscape documents have been prepared by the World Health Organization (WHO) for information purposes only concerning the 2019-2020 global of the novel coronavirus. Inclusion of any particular product or entity in any of these landscape documents does not constitute, and shall not be deemed or construed as, any approval or endorsement by WHO of such product or entity (or any of its businesses or activities). While WHO takes reasonable steps to verify the accuracy of the information presented in these landscape documents, WHO does not make any (and hereby disclaims all) representations and warranties regarding the accuracy, completeness, fitness for a particular purpose (including any of the aforementioned purposes), quality, safety, efficacy, merchantability and/or non-infringement of any information provided in these landscape documents and/or of any of the products referenced therein. WHO also disclaims any and all liability or responsibility whatsoever for any death, disability, injury, suffering, loss, damage or other prejudice of any kind that may arise from or in connection with the procurement, distribution or use of any product included in any of these landscape documents.

Protein Subunit	S protein +Adjuvant	National Institute of Infectious Disease, Japan	COVID-19	Pre-Clinical	Influenza
Protein Subunit	VLP-recombinant protein + Adjuvant	Osaka University/ BIKEN/ National Institutes of Biomedical Innovation, Japan	COVID-19	Pre-Clinical	
Protein Subunit	Native like Trimeric subunit Spike Protein vaccine	Clover Biopharmaceuticals Inc./GSK/Dynavax	COVID-19	Pre-Clinical	HIV, REV Influenza
Protein Subunit	microneedle arrays S1 subunit	Univ. of Pittsburgh	COVID-19	Pre-Clinical	MERS
Protein Subunit	Peptide	Vaxil Bio	COVID-19	Pre-Clinical	
Protein Subunit	Adjuvanted protein subunit (RBD)	Biological E Ltd	COVID-19	Pre-Clinical	
Protein Subunit	Peptide	Flow Pharma Inc	COVID-19	Pre-Clinical	Ebola, Marburg, HIV, Zika, Influenza, HPV therapeutic vaccine, BreastCA vaccine
Protein Subunit	S protein	AJ Vaccines	COVID-19	Pre-Clinical	
Protein Subunit	li-Key peptide	Generex/EpiVax	COVID-19	Pre-Clinical	Influenza, HIV, SARS-CoV
Protein Subunit	S protein	EpiVax/Univ. of Georgia	COVID-19	Pre-Clinical	H7N9
Protein Subunit	S protein (baculovirus production)	Sanofi Pasteur/GSK	COVID-19	Pre-Clinical	Influenza, SARS-CoV

DISCLAIMER:

These landscape documents have been prepared by the World Health Organization (WHO) for information purposes only concerning the 2019-2020 global of the novel coronavirus. Inclusion of any particular product or entity in any of these landscape documents does not constitute, and shall not be deemed or construed as, any approval or endorsement by WHO of such product or entity (or any of its businesses or activities). While WHO takes reasonable steps to verify the accuracy of the information presented in these landscape documents, WHO does not make any (and hereby disclaims all) representations and warranties regarding the accuracy, completeness, fitness for a particular purpose (including any of the aforementioned purposes), quality, safety, efficacy, merchantability and/or non-infringement of any information provided in these landscape documents and/or of any of the products referenced therein. WHO also disclaims any and all liability or responsibility whatsoever for any death, disability, injury, suffering, loss, damage or other prejudice of any kind that may arise from or in connection with the procurement, distribution or use of any product included in any of these landscape documents.

Protein Subunit	Full length recombinant SARs CoV-2 glycoprotein nanoparticle vaccine adjuvanted with Matrix M	Novavax	COVID-19	Pre-Clinical	RSV; CCHF, HPV, VZV, EBOV
Protein Subunit	gp-96 backbone	Heat Biologics/Univ. Of Miami	COVID-19	Pre-Clinical	NSCLC, HIV, malaria, Zika
Protein Subunit	Molecular clamp stabilized Spike protein	University of Queensland/GSK/Dynavax	COVID-19	Pre-Clinical	Nipah, influenza, Ebola, Lassa
Protein Subunit	S1 or RBD protein	Baylor College of Medicine	COVID-19	Pre-Clinical	SARS
Protein Subunit	Subunit protein, plant produced	iBio/CC-Pharming	COVID-19	Pre-Clinical	
Protein Subunit	Recombinant protein, nanoparticles (based on S-protein and other epitopes)	Saint-Petersburg scientific research institute of vaccines and serums	COVID-19	Pre-Clinical	
Protein Subunit	COVID-19 XWG-03 truncated S (spike) proteins	Innovax/Xiamen Univ./GSK	COVID-19	Pre-Clinical	HPV
Protein Subunit	Adjuvanted microsphere peptide	VIDO-InterVac, University of Saskatchewan	COVID-19	Pre-Clinical	
Protein Subunit	Synthetic Long Peptide Vaccine candidate for S and M proteins	OncoGen	COVID-19	Pre-Clinical	
Protein Subunit	Oral E. coli-based protein expression system of S and N proteins	MIGAL Galilee Research Institute	COVID-19	Pre-Clinical	
Protein Subunit	Spike-based	University of Alberta	COVID-19	Pre-Clinical	Hepatitis C

DISCLAIMER:

These landscape documents have been prepared by the World Health Organization (WHO) for information purposes only concerning the 2019-2020 global of the novel coronavirus. Inclusion of any particular product or entity in any of these landscape documents does not constitute, and shall not be deemed or construed as, any approval or endorsement by WHO of such product or entity (or any of its businesses or activities). While WHO takes reasonable steps to verify the accuracy of the information presented in these landscape documents, WHO does not make any (and hereby disclaims all) representations and warranties regarding the accuracy, completeness, fitness for a particular purpose (including any of the aforementioned purposes), quality, safety, efficacy, merchantability and/or non-infringement of any information provided in these landscape documents and/or of any of the products referenced therein. WHO also disclaims any and all liability or responsibility whatsoever for any death, disability, injury, suffering, loss, damage or other prejudice of any kind that may arise from or in connection with the procurement, distribution or use of any product included in any of these landscape documents.

Replicating Viral Vector	Measles Vector	Zyodus Cadila	COVID-19	Pre-Clinical	
Replicating Viral Vector	Measles Vector	Institute Pasteur/Themis/Univ. of Pittsburg Center for Vaccine Research	COVID-19	Pre-Clinical	West Nile, Chik, Ebola, Lassa, Zika
Live attenuated virus	Measles Virus (S, N targets)	DZIF – German Center for Infection Research	COVID-19	Pre-clinical	Zika, H7N9, CHIKV
Replicating Viral Vector	Horsepox vector expressing S protein	Tonix Pharma/Southern Research	COVID-19	Pre-Clinical	Smallpox, monkeypox
Replicating Viral Vector	Live viral vectored vaccine based on attenuated influenza virus backbone (intranasal)	BiOCAD and IEM	COVID-19	Pre-Clinical	
Replicating Viral Vector	Influenza vector expressing RBD	University of Hong Kong	COVID-19	Pre-Clinical	
Replicating Viral Vector	Replication-competent VSV chimeric virus technology (VSVΔG) delivering the SARS-CoV-2 Spike (S) glycoprotein.	IAVI/Batavia	COVID-19	Pre-Clinical	Ebola, Marburg, Lassa
Replicating Viral Vector	VSV-S	University of Western Ontario	COVID-19	Pre-Clinical	HIV, MERS
RNA	LNP-encapsulated mRNA cocktail encoding VLP	Fudan University/ Shanghai JiaoTong University/RNACure Biopharma	COVID-19	Pre-Clinical	
RNA	LNP-encapsulated mRNA encoding RBD	Fudan University/ Shanghai JiaoTong University/RNACure Biopharma	COVID-19	Pre-Clinical	

DISCLAIMER:

These landscape documents have been prepared by the World Health Organization (WHO) for information purposes only concerning the 2019-2020 global of the novel coronavirus. Inclusion of any particular product or entity in any of these landscape documents does not constitute, and shall not be deemed or construed as, any approval or endorsement by WHO of such product or entity (or any of its businesses or activities). While WHO takes reasonable steps to verify the accuracy of the information presented in these landscape documents, WHO does not make any (and hereby disclaims all) representations and warranties regarding the accuracy, completeness, fitness for a particular purpose (including any of the aforementioned purposes), quality, safety, efficacy, merchantability and/or non-infringement of any information provided in these landscape documents and/or of any of the products referenced therein. WHO also disclaims any and all liability or responsibility whatsoever for any death, disability, injury, suffering, loss, damage or other prejudice of any kind that may arise from or in connection with the procurement, distribution or use of any product included in any of these landscape documents.

RNA	Replicating Defective SARS-CoV-2 derived RNAs	Centro Nacional Biotecnología (CNB-CSIC), Spain	COVID-19	Pre-Clinical	
RNA	LNP-encapsulated mRNA	University of Tokyo/Daiichi-Sankyo	COVID-19	Pre-Clinical	MERS
RNA	Liposome-encapsulated mRNA	BIOCAD	COVID-19	Pre-Clinical	
RNA	mRNA	China CDC/Tongji University/Stermina	COVID-19	Pre-Clinical	
RNA	mRNA	Arcturus/Duke-NUS	COVID-19	Pre-Clinical	multiple candidates
RNA	mRNA	BioNTech/Fosun Pharma/Pfizer	COVID-19	Pre-Clinical	
RNA	saRNA	Imperial College London	COVID-19	Pre-Clinical	EBOV; LASV, MARV, Inf (H7N9), RABV
RNA	mRNA	Curevac	COVID-19	Pre-Clinical	RABV, LASV, YFV; MERS, InfA, ZIKV, DengV, NIPV
VLP	Virus-like particle, based on RBD displayed on virus-like particles	Saiba GmbH	COVID-19	Pre-Clinical	
VLP	Plant-derived VLP	Medicago Inc.	COVID-19	Pre-Clinical	Flu, Rotavirus, Norovirus, West Nile virus, Cancer
VLP	ADDomer™ multiepitope display	Imophoron Ltd and Bristol University's Max Planck Centre	COVID-19	Pre-Clinical	
VLP	Unknown	Doherty Institute	COVID-19	Pre-Clinical	
Unknown	Unknown	ImmunoPrecise	COVID-19	Pre-Clinical	
Unknown	Unknown	Tulane University	COVID-19	Pre-Clinical	
Unknown	Unknown	Université Laval	COVID-19	Pre-Clinical	

DISCLAIMER:

These landscape documents have been prepared by the World Health Organization (WHO) for information purposes only concerning the 2019-2020 global of the novel coronavirus. Inclusion of any particular product or entity in any of these landscape documents does not constitute, and shall not be deemed or construed as, any approval or endorsement by WHO of such product or entity (or any of its businesses or activities). While WHO takes reasonable steps to verify the accuracy of the information presented in these landscape documents, WHO does not make any (and hereby disclaims all) representations and warranties regarding the accuracy, completeness, fitness for a particular purpose (including any of the aforementioned purposes), quality, safety, efficacy, merchantability and/or non-infringement of any information provided in these landscape documents and/or of any of the products referenced therein. WHO also disclaims any and all liability or responsibility whatsoever for any death, disability, injury, suffering, loss, damage or other prejudice of any kind that may arise from or in connection with the procurement, distribution or use of any product included in any of these landscape documents.