

# Potential Therapeutics Pipeline — Milken Institute

## Subset of Potential Therapeutical Candidates (as Ordered by Milken Institute)

Count	Treatment	Producer	Current stage of development	Anticipated Timing
1 of 50	Remdesivir	Gilead	Clinical and expanded access	Phase 3 trial results expected April 27th
2 of 50	Scanning anti-viral compounds previously in development	Pfizer	Pre-clinical	Screening completed March, start Phase 1 by end of 2020
3 of 50	TAK-888; Polyclonal hyperimmune globulin	Takeda	Pre-clinical	To patients in 6-18 months
4 of 50	Antibodies from recovered US patient	Lilly/Ab-Cellera	Pre-clinical	Start phase 1 in late July
5 of 50	Antibodies from mice; REGN3048-3051	Regeneron	Pre-clinical	Start phase 1 late summer
6 of 50	Corticosteroids	Peking Union Medical College Hospital	Clinical	Primary study ends April 25, 2020
7 of 50	Kevzara	Regeneron/Sanofi	Clinical	Start phase 2/3 in March/April
8 of 50	Antibody from recovered patients	Celltrion	Pre-clinical	Start phase 1 ~ Sept 2020
9 of 50	ebastine; lopinavir; interferon alpha	Wuhan Red Cross Hospital	Clinical	Primary trial ends March 31, 2020
10 of 50	Recombinant ACE2	The First Affiliated Hospital of Guangzhou Medical University	Clinical	Primary trial ends April 1, 2020
11 of 50	Washed microbiota transplantation	The Second Hospital of Nanjing Medical University	Clinical	Primary trial ends April 2, 2020
12 of 50	PD-1 blocking antibody; Thymosin	Southeast University, China	Clinical	Phase 2 primary trial end April 30, 2020
13 of 50	APN01	University of British Columbia/Apeiron Biologics	Clinical	In Phase 1 pilot in China

# Potential Vaccines Pipeline — Milken Institute

## Subset of Potential Vaccine Candidates (as Ordered by Milken Institute)

Count	Vaccine	Producer	Current stage of development	Anticipated Timing
1 of 41	mRNA 1273	Moderna/NIAID	Pre-clinical	Phase 1 started March 2020 at Kaiser Permanente Washington Health Research Institute in Seattle
2 of 41	DNA plasmid; INO-4800	Inovio Pharmaceuticals	Pre-clinical	Start Phase 1 in April
3 of 41	Deoptimized live attenuated virus	Codagenix	Pre-clinical	Animal data in summer 2020
4 of 41	Non replicating viral vector; Ad26	Janssen Pharmaceutical Companies	Pre-clinical	Start phase 1 by end of 2020
5 of 41	Protein subunit; S protein, baculovirus production	Sanofi Pasteur	Pre-clinical	Start phase 1 March 2021
6 of 41	mRNA	Curevac	Pre-clinical	Start phase 1 in a few months
7 of 41	RNA; BNT162	BioNTech/Fosun Pharma	Pre-clinical	Start phase 1 late April

For a full list of potential vaccine candidates, please go to Appendix 2.

Source: Investment Strategy Group, Milken Institute.

# Appendix 1: Potential Therapeutics Pipeline (Continued)

## 1. Remaining potential therapeutical candidates (as ordered by Milken Institute)

Count	Treatment	Producer	Current stage of development	Anticipated Timing
14 of 50	Treatment (scanning compounds to repurpose)	Novartis	Pre-clinical	
15 of 50	Treatment (scanning compounds to repurpose)	Takeda	Pre-clinical	
16 of 50	Treatment (Prezcobix; JNJ)	Chinese hospital testing	Clinical	
17 of 50	Treatment (scanning compounds to repurpose)	Merck	Pre-clinical	
18 of 50	Treatment (antibodies from recovered patients)	Vir Biotech/WuXi Biologics/Biogen	Pre-clinical	
19 of 50	Treatment (hydroxychloroquine), antimalarial	Numerous trials with Chinese research sponsors	Clinical	
20 of 50	Treatment (Truvada)	Sichuan Academy of Medical Sciences & Sichuan Provincial People's Hospital	Clinical	
21 of 50	Treatment (Jakafi/Jakavi)	Department of Hematology, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology	Clinical	
22 of 50	Treatment (PegIntron, Sylatron, IntronA)	Wuhan Jinyintan Hospital (Wuhan Infectious Diseases Hospital)	Clinical	

# Appendix 1: Potential Therapeutics Pipeline (Continued)

## 1. Remaining potential therapeutical candidates (as ordered by Milken Institute)

Count	Treatment	Producer	Current stage of development	Anticipated Timing
23 of 50	Treatment (Xofluza)	The First Hospital Affiliated to Zhejiang University's Medical School	Clinical	
24 of 50	Treatment (Favipiravir or T-705 or Avigan) licensed in Japan for influenza	Numerous trials with Chinese research sponsors	Clinical	
25 of 50	Treatment (Arbidol; umifenovir) licensed in Russia and China for treatment of respiratory viral infections	Numerous trials with Chinese research sponsors	Clinical	
26 of 50	Treatment (Novaferon, Nova) licensed in China for Hep B	The First Affiliated Hospital of Medical College of Zhejiang University	Clinical	
27 of 50	Treatment (Actemra)	First People's Hospital of University of Science and Technology of China	Clinical	
28 of 50	Treatment (Ampligen)	AIM ImmunoTech/National Institute of Infectious Diseases in Japan	Pre-clinical	
29 of 50	Treatment (repurposing antiviral drug candidates)	Materia Medica/Cyclica	Pre-clinical	
30 of 50	Treatment (RNAi - testing 150 RNAs)	Sirnaomics	Pre-clinical	
31 of 50	Treatment (galidesivir)	BioCryst Pharmaceuticals	Pre-clinical	
32 of 50	Treatment (an antiviral)	Toyama Chemical	Clinical	

# Appendix 1: Potential Therapeutics Pipeline (Continued)

## 1. Remaining potential therapeutical candidates (as ordered by Milken Institute)

Count	Treatment	Producer	Current stage of development	Anticipated Timing
33 of 50	Treatment (screening new drugs + library of antiviral compounds)	Enanta Pharmaceuticals	Pre-clinical	
34 of 50	Treatment (anti-corona (COVID-19) IgG from recovered patients)	Kamada	Pre-clinical	
35 of 50	Treatment (Ganovo (danoprevir); ritonavir; interferon)	Numerous trials with Chinese research sponsors	Clinical	
36 of 50	Treatment (mesenchymal stem cells)	Numerous trials with Chinese research sponsors	Clinical	
37 of 50	Treatment (bevacizumab)	Numerous trials with Chinese research sponsors	Clinical	
38 of 50	Treatment (PLX cell product, placenta-based cell therapy)	Pluristem Therapeutics/BIH Ctr for Regenerative Therapy/Berlin Ctr for Advanced Therapies	Pre-clinical	
39 of 50	Treatment (Ryoncil (remestemcel-L), allogenic mesenchymal stem cells)	Mesoblast	Pre-clinical	
40 of 50	Treatment (favilavir)		Approved in China to treat coronavirus	
41 of 50	Treatment (Cerocal (ifenprodil), NP-120)	Algernon Pharmaceuticals	Pre-clinical	

# Appendix 1: Potential Therapeutics Pipeline (Continued)

## 1. Remaining potential therapeutical candidates (as ordered by Milken Institute)

Count	Treatment	Producer	Current stage of development	Anticipated Timing
42 of 50	Treatment (Brilacidin, a defensin mimetic)	Innovation Pharmaceuticals	Pre-clinical	
43 of 50	Treatment (Ieronlimab (PRO 140), a CCR5 antagonist)	CytoDyn	Pre-clinical	
44 of 50	Treatment (BXT-25)	Bioxytran	Pre-clinical	
45 of 50	Treatment (peptides)	CEL-SCI	Pre-clinical	
46 of 50	Treatment (unknown)	Mateon Therapeutics	Pre-clinical	
47 of 50	Treatment (antibodies)	ImmunoPrecise Antibodies	Pre-clinical	
48 of 50	Treatment (screening drug compounds)	Southwest Research Institute	Pre-clinical	
49 of 50	Treatment (unknown)	NanoViricides	Pre-clinical	
50 of 50	Treatment (siRNA candidates)	Vir Biotech/Alnylam Pharmaceuticals	Pre-clinical	

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Consumer and Investment Management Division

## Appendix 2: Potential Vaccine Pipeline

### Investment Strategy Group

# Appendix 2: Potential Vaccines Pipeline (Continued)

## 1. Remaining potential vaccine candidates (as ordered by Milken Institute)

Count	Treatment	Producer	Current stage of development	Anticipated Timing
8 of 41	Vaccine (DNA)	Takis/Applied DNA Sciences/Evvivax	Pre-clinical	
9 of 41	Vaccine (DNA plasmid)	Zydus Cadila	Pre-clinical	
10 of 41	Vaccine (non replicating viral vector; MVA encoded VLP)	GeoVax/BravoVax	Pre-clinical	
11 of 41	Vaccine (non replicating viral vector; ChAdOx1)	University of Oxford	Pre-clinical	
12 of 41	Vaccine (non replicating viral vector; adenovirus based NasoVAX)	Altimmune	Pre-clinical	
13 of 41	Vaccine (non replicating viral vector; Ad5 S (GREVAX™ platform))	Greffex	Pre-clinical	
14 of 41	Vaccine (non replicating viral vector; Oral Vaccine platform)	Vaxart	Pre-clinical	
16 of 41	Vaccine (non replicating viral vector; Viral-vectored)	CanSino Biologics	Pre-clinical	
17 of 41	Vaccine (protein subunit; Drosophila S2 insect cell expression system VLPs)	ExpreS2ion	Pre-clinical	
18 of 41	Vaccine (protein subunit; S protein)	WRAIR/USAMRIID	Pre-clinical	



## Appendix 2: Potential Vaccines Pipeline (Continued)

### 1. Remaining potential vaccine candidates (as ordered by Milken Institute)

Count	Treatment	Producer	Current stage of development	Anticipated Timing
19 of 41	Vaccine (protein subunit; S trimer)	Clover Biopharmaceuticals Inc./GSK	Pre-clinical	
20 of 41	Vaccine (protein subunit; peptide)	Vaxil Bio	Pre-clinical	
21 of 41	Vaccine (protein subunit; Ii-Key peptide)	GenereX/EpiVax	Pre-clinical	
22 of 41	Vaccine (protein subunit; S protein)	EpiVax/Univ. of Georgia	Pre-clinical	
23 of 41	Vaccine (protein subunit; Full length S trimers/nanoparticle + Matrix M)	Novavax	Pre-clinical	
24 of 41	Vaccine (protein subunit; S protein clamp)	University of Queensland/GSK	Pre-clinical	
25 of 41	Vaccine (protein subunit; S1 or RBD protein)	Baylor, New York Blood Center, Fudan University	Pre-clinical	
26 of 41	Vaccine (protein subunit; Subunit protein, plant produced)	iBio/CC-Pharming	Pre-clinical	
27 of 41	Vaccine (replicating viral vector; measles vector)	Zydus Cadila	Pre-clinical	
28 of 41	Vaccine (replicating viral vector; measles vector)	Institute Pasteur	Pre-clinical	
29 of 41	Vaccine (replicating viral vector; horsepox vector; TNX-1800)	Tonix Pharma/Southern Research	Pre-clinical	

# Appendix 2: Potential Vaccines Pipeline (Continued)

## 1. Remaining potential vaccine candidates (as ordered by Milken Institute)

Count	Treatment	Producer	Current stage of development	Anticipated Timing
30 of 41	Vaccine (RNA; mRNA)	China CDC/Tongji University/Stermina	Pre-clinical	
31 of 41	Vaccine (RNA; mRNA)	Arcturus/Duke-NUS	Pre-clinical	
32 of 41	Vaccine (RNA; saRNA)	Imperial College London	Pre-clinical	
33 of 41	Vaccine (unknown)	University of Pittsburgh	Pre-clinical	
34 of 41	Vaccine (unknown)	University of Saskatchewan	Pre-clinical	
35 of 41	Vaccine (unknown)	ImmunoPrecise	Pre-clinical	
36 of 41	Vaccine (modified infectious bronchitis virus vaccine)	MIGAL Galilee Research Institute	Pre-clinical	
37 of 41	Vaccine (unknown)	Doherty Institute	Pre-clinical	
38 of 41	Vaccine (unknown)	Heat Biologics	Pre-clinical	
39 of 41	Vaccine (unknown)	Tulane University	Pre-clinical	
40 of 41	Vaccine (unknown)	ImmunoPrecise Antibodies	Pre-clinical	
41 of 41	Vaccine (unknown)	AJ Vaccines	Pre-clinical	