

(b)(3):50 USC 3024(i)

SARS-CoV-2 highly
adaptable to humans
early in the outbreak

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(b)(3):50 USC 3024(i)

Zhang et al., 2020

The SARS-CoV-2 virus
has a combination of
multiple unique
structures that have
not been observed in
its most closely
related coronaviruses,
nor has the ancestral
virus been identified in
animal hosts,
according to a 2020
scientific article.

Andersen et al., 2020

(b)(1); (b)(3):10 USC 424; (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(e)

This is the first time
scientists have seen
this combination of
multiple unique
structures in the genus
Betacoronavirus , to
which SARS-CoV-2
belongs

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Andersen et al., 2020

According to reputable
scientists, the multiple
structures individually
have been observed in

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Andersen et al., 2020

other coronaviruses in nature but not in combination						
Coronavirus genetic engineering capabilities have significantly matured worldwide since 2005	(b)(3):50 USC 3024(i)					Zeng et al., 2016; Hu et al., 2017; Menachery et al., 2015; Roberts et al., 2007; Belouzard et al., 2009; Follis et al., 2006; Almazan et al., 2014
(b)(1); (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(e)						
The WIV conducts research on novel coronaviruses and uses genetic engineering to understand pathogenicity,						Zeng et al., 2016; Hu et al., 2017; Ren et al., 2008; Ge et al., 2013; Menachery et al., 2015, 2016; Yang et al., 2015; Wang et al., 2019
	(b)(3):50 USC 3024(i)					
	(b)(3):50 USC 3024(i)					
First direct in vitro manipulation of full-length coronavirus cDNA at Huazhong University. Will simplify the construction of mutant infectious clones and help accelerate progress in coronavirus research						Wang et al., 2019
(b)(1); (b)(3):10 USC 424; (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(e); (b)(6)						

(b)(1); (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(e)

Coronavirus reverse
genetics system at
WIV

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Zeng et al., 2016; Hu et al.,
2017NIH grant funded
EcoHealth Alliance and
WIV up to 2021 to
conduct gain of
function (GOF) studies
on chimeric bat
coronaviruses.Assumes SARS-CoV-2 is a
chimeric virus

NIH 2R01AI110964-06

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Demonstrated GOF
studies in several
coronaviruses
including SARS, MERS,
IBV, and PEDV with
inserted furin cleavage
site

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Cheng et al., 2019; Wan et
al., 2019; Shen et al., 2019;
Wang et al., 2019;
Menachery et al., 2019;
Zhou et al., 2018; Letko et
al., 2018

(b)(3):10 USC 424; (b)(1); (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(e); (b)(6)

Trained scientists in
coronavirus research

(b)(3):50 USC 3024(i)

Zeng et al., 2016; Hu et al.,
2017; Ren et al., 2008; Ge et
al., 2013; Ge et al., 2016

(b)(1); (b)(3):10 USC 424; (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(e)

(b)(1); (b)(3):10 USC 424; (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(d); Sec. 1.4(e); (b)(6)

Published
bat coronavirus
sequence - RATG13

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Lin et al., 2020; Segreto
2020; Monali et al., 2020

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ZC45 and ZXC 21
homologus to SARS-
COV-

Wu, 2020

(b)(1); (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(d); Sec. 1.4(e)

WIV Modified COV
spike genes with spike
genes from different
coronavirus constructs

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Hu et al., 2017

Coronavirus spike
gene swapping using
WIV's reverse genetics
system

Zeng et al., 2016; Hu et al.,
2017

(b)(3):10 USC 424; (b)(1); (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(e); (b)(6)

(b)(1); (b)(3):10 USC 424; (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(e); (b)(6)

						(b)(3):50 USC 3024(i)	
The Furin cleavage sequence of SARS-COV-2 was published by Shi in 2017	(b)(3):50 USC 3024(i)						Ge et al., 2017
Codon optimized spike gene constructed at WIV using restriction fragment length polymorphism							Shang et al., 2020; Zeng et al., 2016

With the furin cleavage site on the S protein, SARS-CoV-2 gains the ability to infect organs or tissues insensitive to other COVs	(b)(3):50 USC 3024(i)					Wang et al., 2020
(b)(1); Sec. 1.4(b); (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(d); Sec. 1.4(e)						
No natural reservoir or intermediate host	(b)(3):50 USC 3024(i)	(b)(3):50 USC 3024(i)	(b)(3):50 USC 3024(i)			Andersen et al., 2020

(b)(3):50 USC 3024(i)

linked to the
pandemic has been
identified

(b)(3):10 USC 424; (b)(1); (b)(3):50 USC 3024(i); Sec. 1.4(b); Sec. 1.4(c); Sec. 1.4(d); Sec. 1.4(e)

(b)(3):50 USC 3024(i)

Xiao et al., 2020

(b)(1); Sec. 1.4(b); (b)(3):50 USC 3024(i); Sec. 1.4(c); Sec. 1.4(d); Sec. 1.4(e)