

An Introduction to the COVID-19 Therapeutic Information Browser

<http://covidtib.mitre.org/>

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Purpose

- Enable biomedical researchers to easily find and track scientific information about potential COVID-19 therapeutics and vaccines

Functionality

- Presents results from natural language processing of paper abstracts and clinical trial summaries at scale
- Enables users to search for terms in some full text of papers and view relevant figures and text snippets

Possible uses

- Tracking latest research on drugs
- Identifying promising drug candidates
- Writing literature reviews
- Conducting meta-analyses
- Identifying knowns and unknowns for research decisions
- And more...

A resource for finding publications and clinical trials about:

Viruses:

SARS-CoV-2, SARS, MERS,
and ten other viruses

Therapeutics:

System reads for ~12,000
unique drugs & biologics

Vaccine research:

Sorted by six types of vaccines*:
vector-based, RNA, DNA, protein
subunit, live attenuated, inactivated

Documents are classified by research stage*:

- Clinical study
- Case report
- Nonhuman primate
- Small animal
- Cell assay
- In vitro
- In silico
- Review

Document sources:

- PubMed
- BioRxiv & MedRxiv (via CORD19¹)
- clinicaltrials.gov
- Full text papers from open source and xDD² partner publishers

* Definitions for the research stages and vaccine types are available on the website

¹ <https://www.semanticscholar.org/cord19>

² <https://xdd.wisc.edu/>

Demo with Examples

The home page briefly describes platform content and how to use it

- ? About
- ☰ Viral Therapeutics
- ☰ Vaccine Type
- ▼ Settings
- 📄 Data
- 📄 Briefing
- 📄 Demo



The menu on the left provides access to other pages

Update: August 3, 2021

COVID-TIB Virus-Drug Pair Data

A dataset containing results from all documents processed through July 6, 2021 is now available for download. This includes virus-drug pairs identified in documents, assignments of documents to research stages, and some additional information. The data description file also contains precision and recall statistics. Please click the "Data" tab in the navigation bar to the left to access this dataset.

About the COVID-19 Therapeutic Information Browser (COVID-TIB)

Welcome! This site provides browsable therapeutic and vaccine-related information about SARS-CoV-2 (COVID-19) and other viruses. This information was extracted via natural language processing (NLP) of more than 200k PubMed, MedRxiv, and BioRxiv abstracts and clinicaltrials.gov summaries¹. The summary tables show the number of documents with information about a given virus and drug (Viral Therapeutics page) or vaccine type (Vaccine Type page). The numbers of papers are arranged by selected research stages, e.g. clinical studies. Metadata about the papers, as well as a link to figures and tables about COVID-19 and a selected drug, are available below. This site also enables keyword full-text search for a subset of papers that are open access.

For information on how to use this site, please see the demo briefing available in the navigation bar on the left. For more information about the NLP pipeline, please see the briefing and description of data available for download in the navigation bar. For more information about term definitions, see the tabs under the "About" menu in the navigation bar. Full text search is powered by xDD and COSMOS from the University of Wisconsin-Madison.

Caveat: Machines are now great at processing documents at-scale but currently are not nearly as accurate as human subject matter experts. Consequently, you will see mistakes in raw machine-extracted information posted here.

Browser recommendation: Internet Explorer is not supported by this application. Please consider using an updated version of Chrome, Edge, Firefox, or Safari.

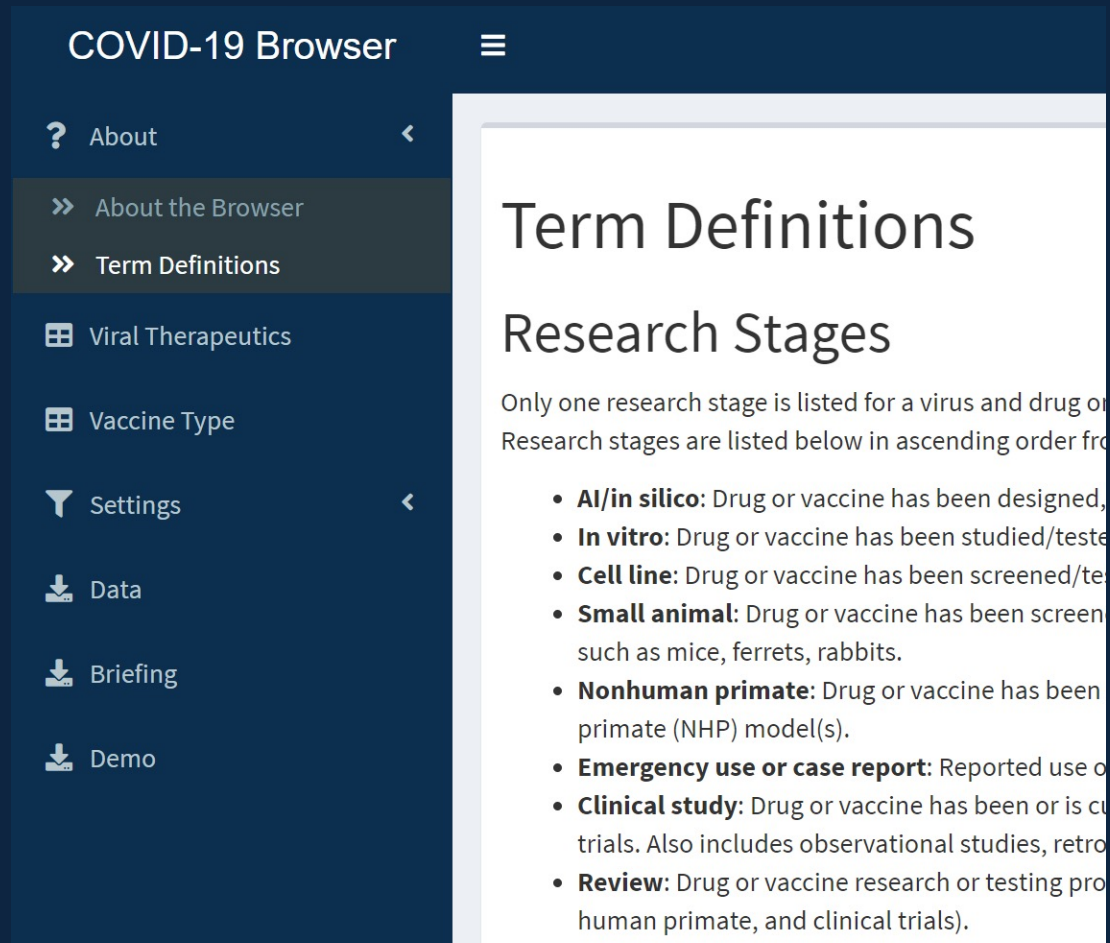
This is a beta version prototype. Your feedback is welcome. Please send comments, suggestions, or bug reports to covid-browser@groups.mitre.org.

[1]: The natural language processing (NLP) uses REACH reading software developed by the University of Arizona (M. Valenzuela-Escárcega et al, Large-scale automated machine reading discovers new cancer-driving mechanisms, Database, Volume 2018, 2018, bay098) that was adapted for virus-related information by MITRE. Data sources include: NCBI, clinicaltrials.gov, the COVID-19 Open Research Dataset, UniProt, and DrugBank.

The pages under About provide term definitions and other information



There is a page for Viral Therapeutics and a page for Vaccine Type information



COVID-19 Browser

- ? About
- >> About the Browser
- >> Term Definitions
- Viral Therapeutics
- Vaccine Type
- Settings
- Data
- Briefing
- Demo

Term Definitions

Research Stages

Only one research stage is listed for a virus and drug or... Research stages are listed below in ascending order from...

- **AI/in silico:** Drug or vaccine has been designed,
- **In vitro:** Drug or vaccine has been studied/teste
- **Cell line:** Drug or vaccine has been screened/te
- **Small animal:** Drug or vaccine has been screen such as mice, ferrets, rabbits.
- **Nonhuman primate:** Drug or vaccine has been primate (NHP) model(s).
- **Emergency use or case report:** Reported use o
- **Clinical study:** Drug or vaccine has been or is c trials. Also includes observational studies, retro
- **Review:** Drug or vaccine research or testing pro human primate, and clinical trials).

On the Viral Therapeutics page, the upper table shows number of documents found about a particular virus, sorted by research stage (columns) for a therapeutic (rows). The red box shows document counts for the 5 candidate therapeutics for SARS-CoV-2 with the most documents.

Viral Therapeutic Papers as of August 13, 2021

This figure shows the numbers of papers found with information about pairs of drugs and viruses, sorted by research stage. Click on a number in the figure to see the papers below the figure. Click on the numbers between Previous and Next to see additional drugs and papers. Type in a drug name in the search box below **Therapeutic** to find a particular drug.

Therapeutic	SARS-CoV-2							All	Review
	All ↓	Review	In Silico	Cell Assay	Animal Models	Case Reports	Clinical Studies		
Hydroxychloroquine	2542	605	131	54	10	381	900	48	26
Remdesivir	1569	472	184	90	15	197	307	60	31
Corticosteroid	1333	305	3	13	0	280	561	131	46
Convalescent Plasma	1308	314	11	11	11	193	441	50	27
Tocilizumab	1061	233	6	4	1	253	454	18	10

1-5 of 2876 rows Show 5 ▾

Previous 1 2 3 4 5 ... 576 Next

Search for therapeutic

Expand to see more drugs, or click Next

Scroll to see more viruses

Example: What drugs are reported to have had recent *in silico* studies?

1. Filter for recent papers in Settings

Filter papers by date:
Past two weeks

Select Document Types
3 items selected

Select Viruses
3 items selected

3. See drugs with recently published *in silico* studies

Therapeutic	SARS-CoV-2						
	All	Review	In Silico ↓	Cell Assay	Animal Models	Case Reports	Clinical Studies
Protease inhibitor	4	0	3	0	1		0
Favipiravir	9	1	3	0	0	3	
Hydroxychloroquine	15	3	2	0	0	0	7
Human immunoglobulin G	21	2	2	0	2	3	6
Zinc	4	1	1	0	0	0	1
Zanamivir	1	0	1	0	0	0	0
Viomycin	1	0	1	0	0	0	0
Tacrolimus	3	1	1	0	0	0	1
Silibinin	1	0	1	0	0	0	0
Salbutamol	1	0	1	0	0	0	0
Rolitetraacycline	1	0	1	0	0	0	0
Ritonavir	2	1	1	0	0	0	0
Ribavirin	1	0	1	0	0	0	0
Remdesivir	19	5	1	1	0	2	5
Quinine	1	0	1	0	0	0	0
Peramivir	1	0	1	0	0	0	0
Oseltamivir acid	1	0	1	0	0	0	0
Naratriptan	1	0	1	0	0	0	0

2. Sort by clicking on In Silico to see drugs with highest numbers of documents on top

Example: What clinical studies have been published about Bamlanivimab?

1. Search for drug name in text box

SARS-CoV-2

Therapeutic All ↓ Review In Silico Cell Assay Animal Models Case Reports Clinical Studies

baml

Bamlanivimab (LY-CoV555) 85 17 0 5 3 6 34

1-1 of 1 rows Show 5 Previous

2. Click on number, then scroll down to table below to see information about those documents

Article ID	Title	Date	Journal Name
34328670	Bamlanivimab use in mild-to-moderate COVID-19 disease: A matched cohort design.	2021-07-30	Pharmacotherapy
10.1101/2021.07.19.21260559	Clinical and Virological Response to a Neutralizing Monoclonal Antibody for Hospitalized Patients with COVID-19	2021-07-22	
34250192	Impact of Bamlanivimab Monoclonal Antibody Treatment on Hospitalization and Mortality Among Nonhospitalized Adults With Severe Acute Respiratory Syndrome Coronavirus 2 Infection.	2021-05-17	Open Forum Infect Dis
34258319	Effectiveness of Severe Acute Respiratory Syndrome Coronavirus 2 Monoclonal Antibody Infusions in High-Risk Outpatients.	2021-06-04	Open Forum Infect Dis

3. Click on title hyperlink to go to abstract or trial summary

Download Therapeutics Evidence

To save search results, download document set as csv file

Example: What drugs have been investigated for long-haul COVID?

1. Type in terms to search for in full text papers; separate phrases with commas

Enter terms or phrases separated by commas (e.g., alpha variant,B.1.1.7).

Type in term(s) to search for in full text journal papers. Multiple terms must be comma-separated. This search will reduce the paper counts shown above to those that contain the term(s). Click on a number to show the set filtered for the given term(s) in the paper table below. In the paper table below, click on a link in the Snippets column to see text snippets with the search term(s) from a paper.

Search the full text of scientific publications

long covid,long haul, post covid syndrome, post-acute sequelae



Match comma-separated terms

Match ANY ("OR" search)

Note: results are limited to papers published by participating publishers.

2. Select Match Any to make this an "OR" search (Select Match ALL for an "AND" search)

3. Scroll up to see numbers of papers about drugs and COVID-19 that mention "long covid"; sort by All

Therapeutic	All ↓
Glucocorticoids	5
Vitamin D	4
Hydroxychloroquine	4
Azithromycin	4
Remdesivir	3

1-5 of 42 rows Show 5

Therapeutic	All ↓
Ivermectin	3
Zinc	2
Steroids	2
Niacin	2
Hydroxymethylglutaryl-CoA Reductase Inhibitors	2

6-10 of 42 rows Show 5

4. Click on the number for a given therapeutic, e.g., Glucocorticoids, to see papers with snippets (next slide)

Example: What is known about Glucocorticoids and long-haul COVID?

5. From prior search, scroll down to view papers about COVID-19 and Glucocorticoids that mention long-haul COVID

Title	Date	Journal Name	Research Stage	Search Snippets
Rethinking the management of immune checkpoint inhibitor-related adrenal insufficiency in cancer patients during the COVID-19 pandemic.	2021-03-08	Endocrinol Diabetes Metab	Review	See Snippets
Early COVID-19 Therapy with Azithromycin Plus Nitazoxanide, Ivermectin or Hydroxychloroquine in Outpatient Settings Significantly Reduced Symptoms Compared to Known Outcomes in Untreated Patients.	2020-11-04	medrxiv	Clinical Study	See Snippets
The angiotensin type 2 receptor agonist C21 restores respiratory function in COVID19 - a double-blind, randomized, placebo-controlled Phase 2 trial	2021-01-28	medrxiv	Clinical Study	See Snippets

6. Click on “See Snippets” to view text snippets about long-haul COVID from the full text paper via University of Wisconsin-Madison’s xDD search

xDD Full Text Results

Show entries

	Snippet
1	. Furthermore, in patients who develop the “ <i>long COVID-19</i> ” syndrome, when to discontinue
2	, the syndrome of ‘ <i>long COVID-19</i> ’ has recently been recognized to refer to patients being ill for more
3	than 4 weeks. ⁷⁵ Two groups of <i>long COVID</i> sufferers have been identified: (1) one with mainly
4	contribute to the symptoms of the ‘ <i>long COVID-19</i> ’ syndrome. In fact, a meta-analysis of 21,350 patients
5	. Although some of the symptoms of the ‘ <i>long COVID-19</i> ’ syndrome may overlap with those of AI

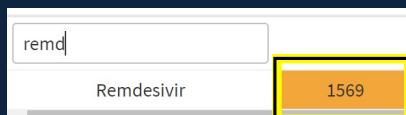
Showing 1 to 5 of 5 entries

Previous Next

Full text publication search is powered by xDD from the University of Wisconsin-Madison.
All xDD output is licensed under CC BY-NC 2.0.

Example: What is known about Remdesivir and SARS-CoV-2?

1. Search for drug name and click on number



2. Scroll down and click on the link to COSMOS

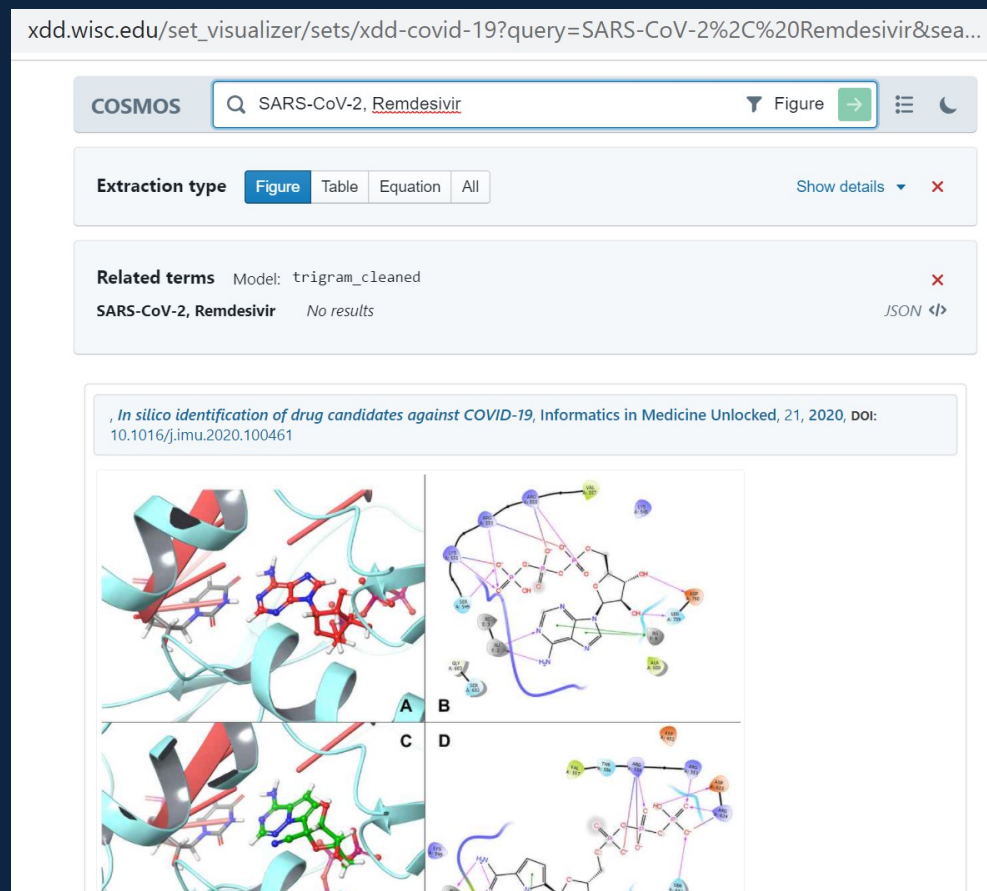
SARS-CoV-2 response to drug Remdesivir

[Drugbank: Remdesivir](#)

[COSMOS: Figures and tables about SARS-CoV-2 and Remdesivir](#)



3. View tables and figures related to COVID-19 and Remdesivir from full text papers processed by the University of Wisconsin-Madison's COSMOS system



Text-mining methods

Natural Language Processing Pipeline

Query for documents about viruses: PubMed, BioRxiv, & MedRxiv abstracts; clinicaltrials.gov entries & metadata



Identify entities and some relations within sentences



Assemble info across sentences & classify documents

A Rule-based Approach

- REACH¹ reading with custom dictionaries, rules, and indicator terms
- Custom R scripts for information assembly & classification

For more information about the NLP methods and an analysis of drug research trends based on this data, see the briefing available for download on the website.

A dataset containing virus-drug results from all documents processed through July 6, 2021 is also available for download. The accompanying data description file includes additional information about methods as well as recall and precision results.

¹M. Valenzuela-Escárcega et al., Database, 2018, bay098

Paper full-text search and information retrieval by:

xDD

- A searchable digital library with full-text publication content provided by open access publishers and xDD partner publishers
- <https://xdd.wisc.edu/>

and

COSMOS

- An AI platform for knowledge discovery from text, tables, and images
- <https://cosmos.wisc.edu/>

Two tools
developed by
University of
Wisconsin-Madison

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Questions?

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