

Antibody News You Should Know

April 1-15, 2020

2nd Special Issue: COVID-19 Interventions

The Antibody Society's series "[Coronavirus in the crosshairs](#)" examines the ongoing discovery and development of COVID-19 interventions for broad use, including small molecule and biologic drugs, and vaccines. Since April 1, we've added 2 additional posts:

- [Part 5, Harnessing the Human Immune System](#), which provides an update on the status of anti-SARS-CoV-2 antibody tests, plasma-based therapeutics, and vaccines as of April 9, 2020.
- [Part 6, Web Resources](#), which provides links to useful links to a sampling of websites that collectively offer extensive, and free, coverage of the COVID-19 pandemic. In particular, this post includes links to numerous websites that offer free access to compiled data for COVID-19 interventions of all types (i.e., therapeutic and vaccines; any composition of matter) in preclinical development and in clinical study.

As we and others have repeatedly stated, ***there is no current evidence from randomized controlled trials to recommend any specific anti-SARS-CoV-2 treatment for patients with suspected or confirmed SARS-CoV-2 infection.*** Therefore, clinical studies must be done to determine the safety and efficacy of the agents when administered to COVID-19 patients.

The Antibody Society will alert the scientific community to new information about

COVID-19 interventions via our website, social media, and email to our members.

Ongoing or pending clinical studies of antibody-based COVID-19 interventions

Numerous antibody products or investigational candidates that may ameliorate symptoms of COVID-19, particularly those caused by pro-inflammatory proteins, are currently being evaluated in clinical studies or such studies are pending. While no monoclonal antibody therapeutics that specifically target SARS-CoV-2 have entered clinical study yet, a Phase 2/3 study evaluating anti-CCR5 antibody leronlimab in patients with severe or critical COVID-19 recently started.

On April 3, 2020, Hoffmann-La Roche's first Phase 3 study (NCT04320615) of tocilizumab in patients with severe COVID-19 pneumonia started. As of April 15, 2020, a total of 17 ongoing studies that included tocilizumab as a COVID-19 intervention were listed on clinicaltrials.gov and an additional 3 were not yet recruiting patients.

- Anti-IL-6R tocilizumab was first approved in Japan in 2005, and it is currently marketed for rheumatoid arthritis in adults, juvenile rheumatoid arthritis, as well as treatment of chimeric antigen receptor T cell-induced severe or life-threatening cytokine release syndrome in patients two years of age and older. Since severe or life-threatening cytokine release is part of the pathology of COVID-19, tocilizumab may help ameliorate symptoms of the disease.

On April 3, 2020, I-Mab announced that the U.S. Food and Drug Administration cleared their investigational new drug application to initiate clinical study for the anti-granulocyte-macrophage colony stimulating factor (GM-CSF) antibody TJM2 to treat cytokine release syndrome associated with severe illness caused by COVID-19.

- GM-CSF is a pro-inflammatory cytokine found in higher levels in severely ill COVID-19 patients. The proposed clinical trial is a multi-center, randomized, double-blind, placebo-controlled, three-arm study to evaluate the safety, tolerability and efficacy of TJM2 in reducing the severity of complications as well as levels of multiple cytokines in patients with severe COVID-19.

On April 06, 2020, Izana Bioscience announced the initiation of a two-center compassionate use study of anti-GM-CSF namilumab in the treatment of patients with rapidly worsening COVID-19. The study will take place in Bergamo and Milan, Italy.

- Namilumab has been evaluated in Phase 2 studies of patients with rheumatoid arthritis, axial spondyloarthritis and plaque psoriasis.

On April 8, 2020, Oncolmmune initiated a randomized, double-blind, placebo-controlled, multi-site, Phase 3 study ([NCT04317040](#)) to evaluate the safety and efficacy of CD24Fc in COVID-19 treatment.

- CD24Fc comprises the nonpolymorphic regions of CD24 attached to the Fc region of human IgG1. in preclinical models of HIV/SIV infections, CD24Fc ameliorated production of multiple inflammatory cytokines, reversed the loss of T lymphocytes as well as functional T cell exhaustion and reduced the leukocyte infiltration of multiple organs.

On April 10, 2020, Eli Lilly and Co. announced they are re-purposing their anti-angiopoietin2 (Ang-2) antibody, LY3127804, as a COVID-19 intervention.

[NCT04342897](#) is a Phase 2 randomized, double-blind, placebo-controlled, clinical trial of LY3127804 in patients who are hospitalized with pneumonia and presumed or confirmed COVID-19. This study has an estimated start date of April 18, 2020.

- Ang-2, a secreted glycoprotein that plays a complex role in angiogenesis and inflammation, is present in elevated levels in patients with acute respiratory distress syndrome. A Phase 1 study of LY3127804 as a treatment for solid tumors was initiated in November 2015.

On April 15, 2020, CytoDyn Inc. announced treatment of the first COVID-19 patient with leronlimab in its Phase 2b/3 trial. NCT04347239 is a Phase 2b/3, randomized, double blind, placebo controlled, adaptive design study to evaluate the efficacy and safety of leronlimab for patients with severe or critical COVID-19.

- Leronlimab is a humanized IgG4 mAb that blocks CCR5, a cellular receptor that is important in HIV infection, tumor metastases, and other diseases. Leronlimab has been evaluated in nine clinical trials that included over 800 people, and met its primary endpoints in a pivotal Phase 3 trial (leronlimab in combination with standard antiretroviral therapies in HIV-infected treatment-experienced patients).

On April 15, 2020, a randomized Phase 2 study of anti-IL-8 therapy BMS-986253 versus standard of care in the treatment of hospitalized cancer patients with severe COVID-19 was posted. The **NCT04347226** study has an estimated start date in April 2020, but was not yet recruiting when first posted.

- BMS-986253 is a human mAb targeting IL-8. The combination of BMS-986253 with nivolumab is being evaluated in multiple clinical studies of cancer patients.

Antibody-based COVID-19 interventions in preclinical development

Numerous organizations and groups have announced plans or progress in developing antibody-based interventions for COVID-19. In our last email, we

highlighted 8 organizations or groups that had announced that their antibody-based interventions for COVID-19 are on track to enter clinical study soon:

1. [Shanghai Junshi Biosciences Ltd.](#) and the Institute of Microbiology of the Chinese Academy of Sciences
2. [Mabpharm Limited](#)
3. [Vir Biotechnology, Inc.](#), working with partners Xencor, Biogen and WuXi
4. [Regeneron Pharmaceuticals](#)
5. [Sorrento Therapeutics](#)
6. [Vanderbilt University Medical Center](#), in collaboration with academic, governmental and corporate partners, including Twist Bioscience and AstraZeneca.
7. [Coronavirus Immunotherapy Consortium](#), using Carterra's proprietary LSA™ platform.
8. [Celltrion](#)

Since there is currently a very substantial medical need for effective COVID-19 interventions, and not all candidates will be successful in clinical studies, ***many initiatives aimed at developing investigational antibody-based therapeutics are needed.*** Follow the links below for recent news about more ongoing programs to discover and develop antibody-based interventions for COVID-19.

- [On April 1, 2020, Neurimmune AG and Ethris GmbH announced](#) an exclusive partnership to develop mRNA-encoded, neutralizing anti-SARS-CoV-2 antibodies administered by inhalation for the treatment of Covid-19. The companies will work to rapidly develop an immunotherapy designed to produce therapeutic antibodies directly in the lungs of affected patients, and they aim to begin clinical testing in Q4 2020, pending regulatory approval.
- [On April 6, 2020, GlaxoSmithKline plc and Vir Biotechnology, Inc. announced](#) they signed an agreement to collaborate on finding solutions for coronaviruses, including SARS-CoV-2. As part of the collaboration, Vir's proprietary monoclonal antibody platform technology

will be used to accelerate existing and identify new anti-viral antibodies that could be used as therapeutic or preventative options to help address the current COVID-19 pandemic and future outbreaks.

- **In an interview on April 7, 2020 Sarah Ives of Distributed Bio** discussed the company's progress in developing an anti-SARS-CoV antibody therapeutic, and confirmed their aim to start clinical studies by September 2020.
- **On April 8, 2020, Boehringer Ingelheim confirmed** their scientists are currently searching for novel virus-neutralizing antibodies. A **collaboaration with YUMAB** to apply their phage display technology had previously been announced. Boehringer Ingelheim is also actively participating with its COVID-19 projects in several research consortia, such as the Innovative Medicines Initiative of the European Union and an initiative led by the Bill and Melinda Gates Foundation.
- **On April 8, 2020, Vanderbilt University Medical Center announced that they have partnered with and AstraZeneca** to identify candidates for antibody-based treatments for COVID-19. Researchers at VUMC have already discovered SARS-CoV-2 neutralizing antibodies. The genetic sequences will be provided to AstraZeneca for identification of the most promising candidates for clinical assessment and future clinical use. **VUMC is also working with Twist Bioscience** and its Twist Biopharma division to discover anti-SARS-CoV-2 antibodies.
- **On April 13, 2020, Celltrion announced** that their expedited development process has yielded 14 potent neutralizing antibodies against SARS-CoV-2. Cell line development will commence, and they anticipate moving to first-in-human clinical trials in July 2020.

Coronavirus Photo by Fusion Medical Animation on Unsplash

Antibody News You Should Know

April 15 - May 1, 2020

The Antibody Society's series "[Coronavirus in the crosshairs](#)" examines the ongoing discovery and development of COVID-19 interventions, including small molecule and biologic drugs, and vaccines. The latest installment on diagnostic tests (Part 7), as well as previous installments covering re-purposed drugs and biologics, and new therapeutic and vaccine interventions (Parts 1-6) can be found here: antibodysociety.org/covid-19/

The recent key events in antibody-based therapeutics development described below involve **both non-COVID-19 as well as COVID-19 interventions**. Follow the links below for more details.

[New to regulatory review \(non-COVID-19 interventions\)](#)

As discussed in "[Antibodies to watch in 2020](#)", we anticipated that the Food and Drug Administration (FDA) would be busy this year, with submission of more than a dozen biologics license applications (BLAs) expected. These applications are indeed being submitted, despite the disruptions due to COVID-19.

On April 16, 2020, Regeneron Pharmaceuticals, Inc. announced that the U.S. FDA has accepted for [Priority Review a BLA for REGN-EB3](#) for Ebola. The target action date for the FDA decision is October 25, 2020. REGN-EB3 received Orphan Drug and Breakthrough Therapy designations from FDA. It is being developed under an ongoing collaboration and with funding provided by the US Biomedical Advanced Research and Development Authority.

- REGN-EB3 is an investigational triple-antibody cocktail treatment for Ebola virus infection.

On April 16, 2020, Provention Bio, Inc. announced the initiation of the **rolling submission of a BLA to the FDA for teplizumab** for the delay or prevention of clinical Type 1 diabetes (T1D) in at-risk individuals, as indicated by the presence of two or more T1D-related autoantibodies. Rolling submission allows for completed modules of the BLA to be submitted and reviewed by the FDA on an ongoing basis. The non-clinical module was submitted, and the company expects to submit the clinical module in Q3 and the chemistry, manufacturing and controls (CMC) module in Q4 of 2020.

- Teplizumab (PRV-031) is an anti-CD3 monoclonal antibody

On April 22, 2020, Biogen disclosed that they have an **open BLA for aducanumab** for Alzheimer's disease and have begun to submit modules to the FDA. Following a pre-BLA meeting scheduled for the summer, the company expects to complete the submission in Q3 2020. FDA granted aducanumab Fast Track designation, which allows rolling submission of the BLA, in 2016. Biogen is developing aducanumab in collaboration with Eisai Co., Ltd.

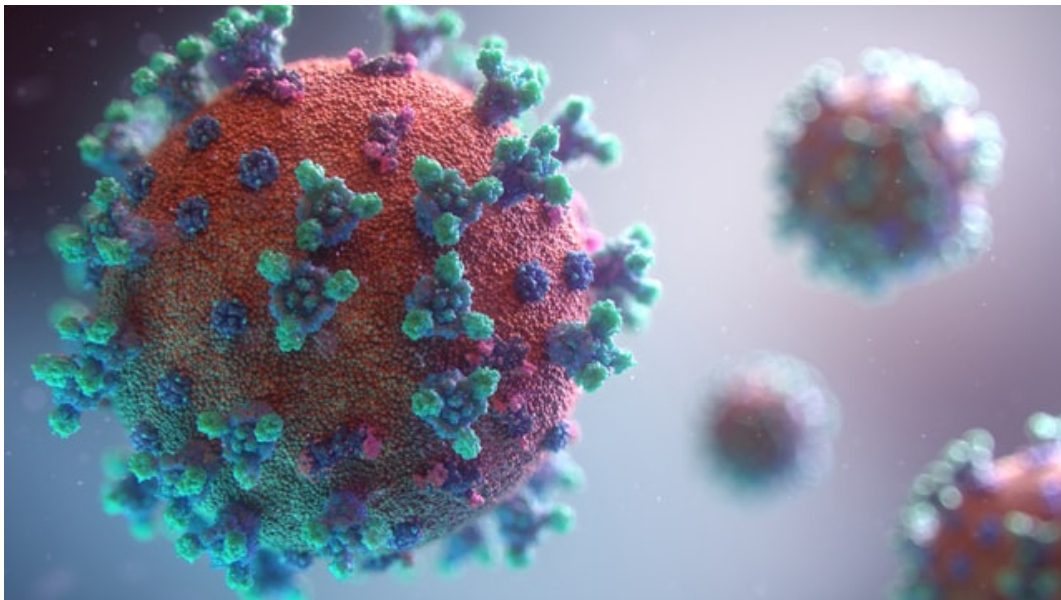
- Aducanumab is an anti-amyloid beta antibody candidate for the potential treatment of Alzheimer's disease.

On April 24, 2020, Sanofi disclosed that they submitted a BLA to FDA for sutimlimab for the treatment of cold agglutinin disease (CAD). **A regulatory decision is expected in Q3 2020**. Sutimlimab has been granted FDA's Breakthrough Therapy designation, as well as Orphan Drug status by the FDA, European Medicines Agency and the Pharmaceuticals and Medical Devices Agency in Japan.

- Sutimlimab targets C1s, a complement-pathway protein. Activation of the classical complement pathway is the central mechanism of hemolysis in CAD and blocking it may potentially halt the CAD disease process.

On April 27, 2020, CytoDyn announced that they had **completed a BLA for leronlimab** as a combination therapy with highly active antiretroviral therapy for highly treatment experienced HIV patients by submitting the clinical and the CMC portions to the FDA. The FDA previously granted Fast Track designation for leronlimab and rolling review for the company's BLA in the HIV indication.

- Leronlimab targets the CCR5 receptor, and blocks viral entry into cells. It also appears to play a central role in modulating immune cell trafficking to sites of inflammation.



New developments in COVID-19 interventions

The Antibody Society is closely tracking ~85 programs involving the development of recombinant protein therapeutics, mostly monoclonal antibodies, as COVID-19 interventions.

While some are intended to ameliorate symptoms of the disease, such as cytokine storms or blood clotting, ~55 directly target SARS-CoV-2 or block its entry into cells.

New programs announced during April 15 - May 1 include:

- **FairJourney Biologics (Porto, Portugal) and IONTAS (Cambridge, UK)** announced a partnership to expedite the identification of effective antibodies for a therapeutic to treat COVID-19 patients.
- **SAB Biotherapeutics** announced they were advancing a transgenic cow-derived human polyclonal antibody therapeutic for COVID-19 in partnership with the Department Of Defense and BARDA.
- **Molecular Partners** announced that they initiated an anti-COVID-19 therapeutic program leveraging multi-target binding of DARPin® proteins to neutralize SARS-CoV-2 virus.
- **AvantGen, Inc.** announced it has identified and tested fully human synthetic antibodies against SARS-CoV-2 that show promise for development as diagnostics for SARS-CoV-2 infection and therapeutics for COVID-19.
- **Atreca, Inc., BeiGene, Ltd., and IGM Biosciences, Inc.** announced they will leverage their combined technology and expertise in an effort to discover, develop, and manufacture novel IgM and IgA antibodies targeting SARS-CoV-2 for the potential treatment of COVID-19.

In other news about antibody COVID-19 interventions:

On April 20, 2020, **Light Chain Bioscience (a brand of NovImmune SA) and Edesa Biotech** announced a strategic agreement for an exclusive worldwide license to develop and commercialize two Phase 2-ready biologic drug candidates for all therapeutic, prophylactic and diagnostic applications, including COVID-19 pneumonia.

- The monoclonal antibodies licensed from Light Chain Bioscience target the signaling proteins TLR4 and CXCL10.

On April 15, 2020, Humanigen announced plans for a **Phase 3 clinical trial of lenzilumab** for the prevention of respiratory failure and/or death in hospitalized patients with pneumonia associated with SARS-CoV-2 infection. In the **NCT04351152 Phase 3 study**, 238 patients will be randomized to receive lenzilumab + standard of care (SOC) vs. SOC in a 1:1 ratio. An

interim analysis is planned for the Data and Safety Monitoring Board to assess safety and efficacy data. The estimated study completion date is September 2020.

- Lenzilumab is a human IgG1 antibody targeting granulocyte-macrophage colony-stimulating factor.

On April 20, 2020, **Alexion Pharmaceuticals Inc. announced plans to initiate a Phase 3 Study of ULTOMIRIS®** (ravulizumab-cwvz) in hospitalized patients with severe COVID-19. **NCT04369469 is a Phase 3 open-label, randomized, controlled study** to evaluate the efficacy and safety of intravenously administered ravulizumab compared with best supportive care in patients with COVID-19 severe pneumonia, acute lung injury, or acute respiratory distress syndrome. The estimate primary completion date is November 2020.

- ULTOMIRIS® is a humanized Ig2/4 antibody targeting C5 that was first approved in 2018 for treatment of adult patients with paroxysmal nocturnal hemoglobinuria.

On April 28, 2020, Innate Pharma SA announced that the first patient was dosed in a randomized, double-blind **Phase 2 clinical trial evaluating the safety and efficacy of avoralimab in in COVID-19** patients with severe pneumonia. Started on April 27, 2020, the **NCT04371367 Phase 2** study of avdoralimab vs. placebo has a primary completion date of June 27, 2020.

- Avdoralimab (IPH5401) is a human antibody that targets C5a receptors.

On April 28, 2020, **R-Pharm JSC and Cromos Pharma announced the first patients have been randomized into a Phase 2/3 clinical trial evaluating olokizumab and RPH-104 in patients with severe COVID-19**. The multi-center, double-blind, Phase 2/3 trial has an adaptive design with two components. The trial will first recruit ~180 patients with severe COVID-19 infection across approximately 20 hospital sites. Through 1:1:1 randomization it will evaluate efficacy and safety of the two drugs in addition to supportive care and supportive care alone in patients with severe COVID-19 infection. The results of the Phase 2 part of the trial will be used in an adaptive manner to determine transition to the larger Phase 3 part that will comprehensively assess the longer-term outcomes, such as the need for mechanical ventilation and death.

- Olokizumab is a humanized monoclonal antibody with high affinity for interleukin-6.
- RPH-104 is a fusion protein that selectively binds and inactivates interleukin-1 β .

Antibody News You Should Know

May 1 - 15, 2020

The Antibody Society's series "[Coronavirus in the crosshairs](#)" examines the ongoing discovery and development of COVID-19 interventions, including small molecule and biologic drugs, and vaccines. The latest installment on FDA's emergency use authorization of therapeutics (Part 8), as well as previous installments covering re-purposed drugs and biologics, new therapeutic and vaccine interventions and diagnostics (Parts 1-7) can be found here: antibodysociety.org/covid-19/

The recent key events in antibody-based therapeutics development described below involve **both non-COVID-19 as well as COVID-19 interventions**. Follow the links for more details.

[Updates on non-COVID-19 interventions](#)

On May 14, 2020, Mersana Therapeutics, Inc. announced the [initiation of patient dosing in a Phase 1 dose escalation study evaluating XMT-1592](#). This Phase 1, open-label, dose-escalation study is designed to determine the maximum tolerated dose of XMT-1592 in patients with non-small cell lung cancer adenocarcinoma and ovarian cancer.

- XMT-1592 is an antibody-drug conjugate targeting NaPi2b with an auristatin DolaLock payload.

On May 5, 2020, Regeneron announced that they [initiated a rolling biologics license application \(BLA\) submission for evinacumab](#) for homozygous familial hypercholesterolemia and plans to submit a marketing authorization application in the EU in the second half of 2020.

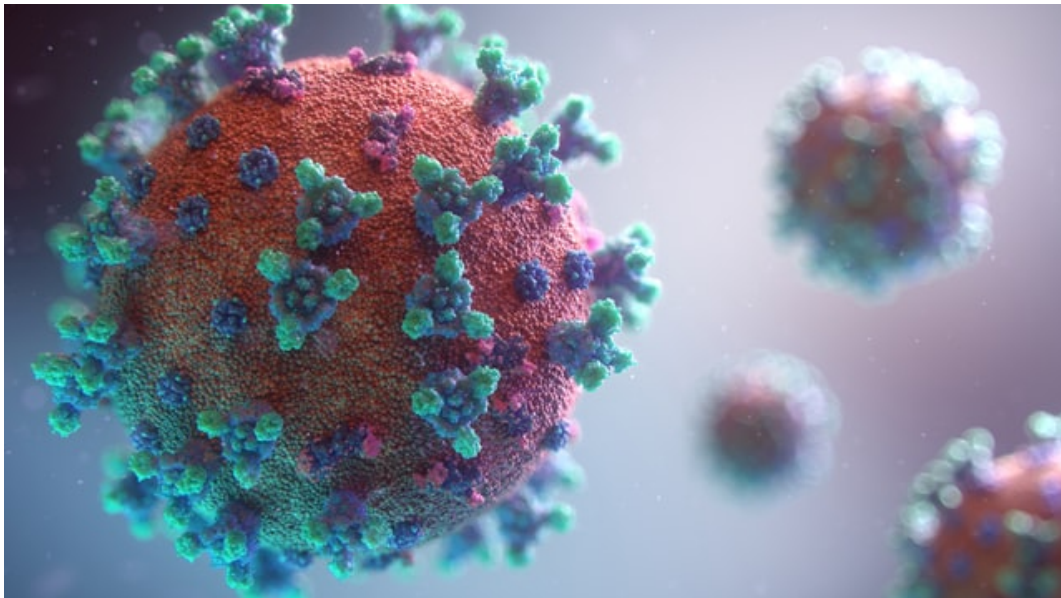
- Evinacumab is a human IgG4 monoclonal antibody targeting angiopoietin-like 3

On May 13, 2020, CytoDyn confirmed that, on May 11, 2020, it **submitted all remaining parts of the BLA for leronlimab** as a combination therapy with HAART for highly treatment-experienced HIV patients. The U.S. Food and Drug Administration (FDA) will start reviewing the BLA for completeness and will make a filing decision. After the BLA submission is deemed completed, the FDA will assign a goal date for a first action on the application. The company plans to request a priority review for the BLA.

- Leronlimab is an humanized IgG4 monoclonal antibody targeting CCR5.

On May 14, 2020, Sanofi announced that **FDA granted priority review of Sanofi's BLA for sutimlimab** for the treatment of hemolysis in adult patients with cold agglutinin disease. The target action date for the FDA decision is November 13, 2020.

- Sutimlimab is an IgG4 monoclonal antibody targeting C1s in the classical complement pathway.



New developments in COVID-19 interventions

The Antibody Society is closely tracking ~100 programs involving the development of recombinant protein therapeutics, mostly monoclonal antibodies, as COVID-19 interventions. While some are intended to ameliorate symptoms of the disease, such as elevated levels of cytokines or abnormal clotting, more than 60 directly target SARS-CoV-2 and block its entry into cells.

New programs announced during May 1 - 15, 2020 include:

- Junshi Biosciences and Eli Lilly and Company entered into an agreement to co-develop therapeutic antibodies for the potential prevention and treatment of COVID-19. Junshi Bioscience has engineered multiple neutralizing antibodies, **with the lead asset poised to enter clinical testing in the second quarter of 2020.**
- Sorrento Therapeutics, Inc. and Mount Sinai Health System joined forces in the investigation and development of an antibody cocktail (COVI-SHIELD™) to potentially treat COVID-19. Sorrento is completing all IND filing requirements for the triple antibody combination therapy, which is likely to include their **STI-1499 SARS-CoV-2 neutralizing antibody**, and **expects to commence Phase 1 trials of the drug candidate in the third quarter of 2020.**
- Chugai Pharmabody Research Pte. Ltd. (CPR) has begun joint research on a anti-SARS-CoV-2 therapeutic antibody, with the Agency for Science, Technology and Research (A*STAR) in Singapore. The project focuses on a potential therapeutic antibody that was discovered by a research team at A*STAR's Singapore Immunology Network. Lead candidates were isolated from a high diversity synthetic human antibody library and showed high potency in neutralizing live coronavirus. **CPR will lead the antibody optimization and create a clinical candidate antibody.**

In other news about COVID-19 interventions:

On May 5, 2020, **Regeneron announced that they are advancing REGN-COV2**, a novel investigational antibody "cocktail" treatment designed to prevent and treat the SARS-CoV-2 virus. In April, Regeneron moved its leading neutralizing antibodies into pre-clinical and clinical-scale cell production lines and **plans to begin clinical studies in June 2020.** The company is working to rapidly scale-up manufacturing, with a goal to have hundreds of thousands of preventative doses available by the end of August 2020.

On May 7, 2020, **YUMAB announced that their human SARS-CoV-2 antibody candidate** exhibits a coronavirus neutralizing effect, as confirmed in preclinical tests with COVID-19 patient sera at the Helmholtz Center for Infection Research. Another round of several hundred antibodies is currently being screened while YUMAB coordinates the next steps with partners and regulatory bodies towards clinical development. **YUMAB expects to start clinical studies in humans in the second half of 2020.**

On May 7, 2020, **Molecular Partners announced completion of in vitro potency assessments of its DARPIn® candidates** targeting live, replicating coronavirus SARS-CoV-2.

These candidates show extremely robust antiviral activity, with several candidates demonstrating complete neutralization with low picomolar potency. **The company expects to start clinical studies in humans in the second half of 2020.**

Information about a Phase 2, randomized, double-blind, placebo-controlled, multicenter study to evaluate the safety and efficacy of **MSTT1041A (astegolimab) or UTTR1147A in patients with severe COVID-19 pneumonia** was posted to clinicaltrials.gov on May 13, 2020. NCT04386616 is due to start on May 20, 2020. The primary outcome measure is clinical status, assessed using a 7-Category ordinal scale [Time Frame: Day 28], and the estimated primary completion date is September 24, 2020.

- Astegolimab is a human IgG2 monoclonal antibody that targets IL-33R.
- UTTR1147A is a recombinant fusion protein that links the human cytokine IL-22 with the Fc portion of human IgG4. UTTR1147A was previously evaluated in Phase 2 studies of patients with ulcerative colitis, Crohn's disease and neuropathic diabetic foot ulcers.



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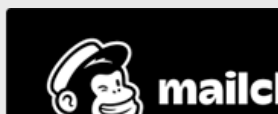
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Antibody News You Should Know

May 15 - June 1, 2020

Coronavirus in the crosshairs, Part 9:

Anti-SARS-CoV-2 biologics entering clinical study is now online!

As of the end of May 2020, more than 15 organizations have announced that their anti-SARS-CoV-2 molecules may enter clinical study during June to December 2020. [This installment of the series](#) includes:

- Name of organization and partners
- Type of molecule (mostly antibody, but also DARPin and fusion proteins)
- Estimated timing of the start of clinical studies

And, since you were wondering about [approval success rates](#) for anti-infective antibodies vs. all antibody therapeutics, we included that too!

The recent events in antibody-based therapeutics development described below involve **both non-COVID-19 as well as COVID-19 interventions**. Follow the links for more details.

[Updates on non-COVID-19 interventions](#)

License agreements

On May 15, 2020, [Lava Therapeutics B.V.](#), announced that it has entered into a research and license agreement with [Janssen Biotech, Inc.](#) to discover and develop novel bispecific antibodies to $\gamma\delta$ T cells for the treatment of cancer.

- [\$\gamma\delta\$ T cells](#), which are a distinct subgroup of T cells containing T cell receptor γ and TCR δ chains, participate in immune responses during cancer progression. Bispecific antibodies can be designed to direct these T cells to tumor cells.

On May 15, 2020, [LegoChem Biosciences, Inc. announced a worldwide license agreement with Iksuda Therapeutics](#) for the development and commercialization of LCB73 for hematological tumors. LCB73 was generated in a partnership between LCB and Swiss-based Light Chain Bioscience (Novimmune SA).

- LCB73 is a CD19-targeted antibody-drug conjugate (ADC).

First Phase 1, Phase 2 or Phase 3 studies

First posted to clinicaltrials.gov on May 21, 2020, [NCT04397276](#) is a Phase 1 study of JNJ-70218902, a T-cell redirecting agent, in advanced stage solid tumors. Participants with metastatic castration-resistant prostate cancer will receive JNJ-70218902. In part 1 of the study, dose levels will be escalated sequentially based on the decisions of the Study Evaluation Team (SET) until the recommended Phase 2 Dose (RP2D) has been identified. In part 2, participants will receive JNJ-70218902 at the RP2D determined in Part 1. The study is not yet recruiting patients; the estimated study start date is June 25, 2020.

- Publicly available information about JNJ-70218902's composition of matter has not yet been found.

On May 26, 2020, [Sorrento Therapeutics, Inc. announced](#) it received clearance from the U.S. Food and Drug Administration (FDA) for its investigational new drug application (IND) for STI-6129. [NCT04316442](#), a Phase 1, open-label, dose-escalation study of the safety and efficacy of STI-6129 in patients with relapsed or refractory systemic amyloid light chain amyloidosis, has an estimated study start date of August 1, 2020.

- STI-6129 is an anti-CD38 ADC with a Duostatin 5 payload added using site-specific C-LOCK conjugation technology.

On May 27, 2020, [Vir Biotechnology, Inc. announced the initiation of a Phase 1 clinical trial of VIR-3434](#), which will assess the safety, tolerability, pharmacokinetics, antiviral and immunomodulatory activity of this monoclonal antibody in healthy volunteers and patients with chronic HBV infection.

- VIR-3434 is an HBV-neutralizing monoclonal antibody designed to block entry of all 10 genotypes of HBV into hepatocytes, and to reduce the level of virions and subviral particles in the blood. The Fc region has been engineered for extended half-life and to include the XX2 "vaccinal mutation," for which Vir has licensed exclusive rights for all infectious diseases.

On May 21, 2020, [Alethia Biotherapeutics](#) announced that the FDA has cleared its Phase 2 IND application for AB-16B5. The company to initiate a multi-center trial ([NCT04364620](#)) of AB-16B5 in combination with docetaxel in previously treated subjects with metastatic non-small cell lung cancer (NSCLC) who have experienced disease progression following treatment with a platinum-containing doublet treatment and an anti-PD1 or PD-L1 immune checkpoint antibody.

- AB-16B5 is a humanized IgG2 monoclonal antibody that selectively binds and inhibits tumor-associated secreted clusterin, a protein expressed in many cancers.

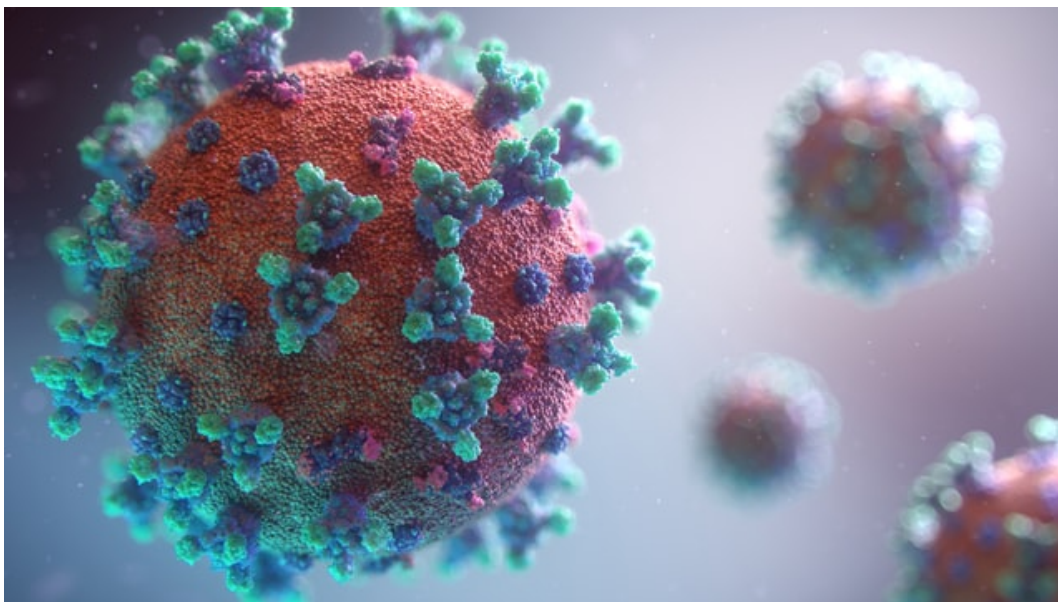
First posted to clinicaltrials.gov on May 29, 2020, [NCT04408638](#) is a Phase 3, open-label, multicenter, randomized study evaluating the efficacy and safety of glofitamab in combination with gemcitabine plus oxaliplatin versus rituximab in combination with gemcitabine and oxaliplatin in patients with relapsed/refractory diffuse large B-cell lymphoma.

- Glofitamab (RO7082859, CD20-TCB, RG6026) is a bispecific antibody with IgG-like pharmacokinetic properties whose “2:1” structure leads to increased tumor antigen avidity, T cell activation, and tumor cell killing, as compared to other T cell engaging bispecific antibody molecular formats. The molecule comprises two CD20 binding Fabs (derived from the Type II CD20 IgG1 obinutuzumab), one CD3e binding Fab (fused to one of the CD20 Fabs via a short flexible linker), and an engineered, heterodimeric Fc region with completely abolished binding to FcγRs and C1q.

Regulatory review update

On May 28, 2020, [MacroGenics, Inc.](#) announced that the FDA notified the company that it is no longer planning to hold an Oncologic Drugs Advisory Committee meeting to discuss the Biologics License Application for margetuximab. The FDA also stated it continues to anticipate meeting the Prescription Drug User Fee Act goal date for the application review, which is December 18, 2020.

- Margetuximab is an Fc-engineered, monoclonal antibody that targets human epidermal growth factor receptor 2.



New developments in COVID-19 interventions

The Antibody Society is closely tracking over 110 programs involving the development of recombinant protein therapeutics, mostly monoclonal antibodies, as COVID-19 interventions. While some are intended to ameliorate symptoms of the disease, such as elevated levels of cytokines or abnormal clotting, more than 60 directly target SARS-CoV-2 and block its entry into cells.

News announced during May 15 - June 1, 2020 include:

On May 28, 2020, **Abcore, Inc. announced a panel of functional single domain antibodies** (sdAbs) therapeutic candidates they discovered and tested for the treatment of Coronavirus Disease 2019 (COVID-19). The therapeutic candidates bind to the spike protein of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and functionally block binding to its target, angiotensin converting enzyme-2.

- Abcore's antibody discovery and phage display platform includes a high diversity library of over 100 billion sdAbs, which was screened, allowing isolation of a large number of potential binders that were then biologically characterized.

On May 19, 2020, **Prellis Biologics, Inc. announced that it generated 300 human IgG antibodies** that bind to either the S1 or S2 spike protein of the SARS-CoV2 Wuhan strain. The

company expects refinement of its lead candidates to take about one month, after which they will pursue development of a multi-antibody cocktail therapeutic.

- Prellis' Externalized Human Immune System™ technology, was used to produce 960 synthetic human lymph nodes, which, when challenged with a SARS-CoV2 vaccine-like cocktail, yielded the antibodies.

On May 27, 2020, [Virna Therapeutics announced that they are partnering with University of Toronto to in-license neutralizing antibodies](#) targeting the SARS-CoV-2 spike protein to treat COVID-19. The discovery was made in the laboratory of Prof. Sachdev Sidhu at the University of Toronto's Donnelly Centre for Cellular and Biomolecular Research.

On May 28, 2020, Cerecor Inc. announced they are proceeding with a [proof-of-concept clinical trial of CERC-002](#), a human IgG4 monoclonal antibody targeting the inflammatory cytokine LIGHT, in patients with COVID-19 cytokine storm-induced acute respiratory distress syndrome. The first patient is expected to enroll in June and top-line data are expected in the fourth quarter of 2020.

- Licensed from Kyowa Kirin Co., Ltd., CERC-002 (also known as MDGN-002) is undergoing evaluation in a Phase 1 clinical study (NCT03169894) of patients with Crohn's disease.

First posted on May 26, 2020, [NCT04401475](#) is a Phase 2, randomized, double-blind, placebo-controlled study to evaluate the safety and efficacy of EB05 + standard of care (SOC) vs. placebo + SOC in adult hospitalized patients with moderate to severe COVID-19 pneumonia. The first patient is expected to enroll in July and the estimated primary completion date is September 2020.

- EB05 is a humanized IgG1 antibody targeting Toll-like receptor 4 licensed to Edesa Biotech by Light Chain Bioscience in April 2020 for development as a COVID-19 intervention.



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Antibody News You Should Know

June 1 - 15, 2020

COVID-19 Biologics Tracker is now online!

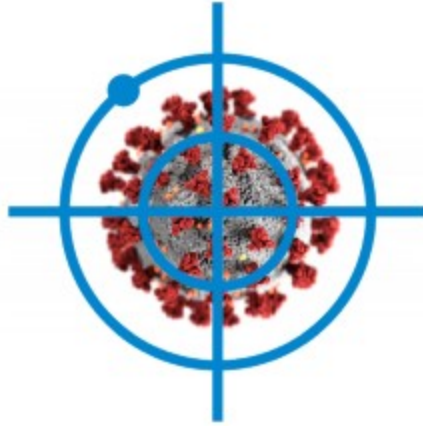
The Antibody Society, in collaboration with the Chinese Antibody Society, is tracking over 140 recombinant protein-based COVID-19 interventions in preclinical and clinical development. Our ongoing collaboration is designed to provide data, analysis and commentary relating to COVID-19 interventions to the scientific community.

Our **COVID-19 Antibody Therapeutics Tracker** includes data relating to COVID-19 biologics discovery programs and specific molecules in preclinical and clinical development. The database includes:

- Drug code and other names
- Target and format
- Development status
- Sponsoring organization and partners

Detailed information about the clinical studies of the anti-SARS-CoV-2 antibodies, including results when available, can be [found here](#).

The “**Coronavirus in the Crosshairs**” series provides analyses and commentary on the ongoing discovery and development of COVID-19 interventions for broad use, including small molecule and biologic drugs, and vaccines.



Special Issue on COVID-19 interventions

The Antibody Society is closely tracking over 140 programs involving the development of recombinant protein therapeutics, mostly monoclonal antibodies, as COVID-19 interventions. While some are intended to ameliorate symptoms of the disease, such as elevated levels of cytokines or abnormal clotting, more than 80 directly target SARS-CoV-2 and block its entry into cells.

During June 1-15, 2020, 4 companies announced that their anti-SARS-CoV-2 antibodies entered a first-in-humans study:

On June 1, 2020, **Eli Lilly and Company announced LY-CoV555, an anti-SARS-CoV2 IgG1 antibody, has been administered to COVID-19 patients.** LY-CoV555 is the first antibody specifically targeting SARS-COV-2 to enter clinical study.

- The antibody was developed via a collaboration between Lilly and AbCellera. AbCellera, with the Vaccine Research Center at the National Institute of Allergy and Infectious Diseases, isolated single B cells from convalescent patients, identified a pool of ~500 candidate antibodies against the virus' spike protein and selected leads from this pool. Lilly scientists further developed LY-CoV555 in just three months.
- The placebo-controlled study ([NCT04411628](#)) will assess the safety, tolerability, pharmacokinetics, and pharmacodynamics of LY-CoV555 following a single dose in patients hospitalized with COVID-19. Results are anticipated by the end of June 2020. The company intends to test LY-CoV555 and other neutralizing antibodies against SARS-CoV-2 over the next several months as monotherapy or antibody cocktails for COVID-19.

- The start of a Phase 2 ([NCT04427501](#)), randomized, double-blind, placebo-controlled, Phase 2 study to evaluate the efficacy and safety of LY3819253 in participants with mild to moderate COVID-19 illness is pending.

On June 7, 2020, [Junshi Biosciences announced that a Phase 1 clinical study of JS016 in healthy volunteers had started in China.](#)

- JS016 is a human monoclonal antibody that targets the SARS-CoV-2 spike protein and blocks binding of the virus to host cells. The antibody was identified by screening B cells from convalescent COVID-19 patients, and engineered to introduce LALA mutations to silence the Fc portion. JS016 was shown to provide protection from SARS-CoV-2 infection when administered to rhesus monkeys ([Shi et al. Nature 2020](#)).
- The clinical study will evaluate the tolerability, safety, pharmacokinetics and immunogenicity of JS016 in healthy volunteers. If the Phase 1 study shows the antibody can be administered safely, Junshi Biosciences intends to start another clinical study in that will assess JS016's ability to prevent and treat COVID-19.
- Junshi and Eli Lilly and Company are collaborating to co-develop JS016, with Junshi leading clinical development in China and Lilly leading clinical development in the rest of the world. The antibody was jointly developed by Junshi Biosciences and the Institute of Microbiology, Chinese Academy of Sciences.

On June 9, 2020 Singapore-based biotechnology company [Tychan Pte Ltd. initiated a Phase 1 study \(NCT04429529\) to evaluate TY027](#), a monoclonal antibody that specifically targets SARS-CoV-2, in healthy volunteers.

- The safety of the antibody will be assessed in this time lagged, randomized, placebo controlled, double blind, single ascending dose (0.5 - 20 mg) study.

On June 11, 2020, [Regeneron Pharmaceuticals, Inc. announced the start of the first clinical trial of REGN-COV2 for the prevention and treatment of COVID-19.](#)

- REGN-COV2 is a cocktail of the human antibodies REGN10933 and REGN10987, which were derived from Regeneron's parallel efforts using both humanized VelocImmune® mice and blood samples from recovered COVID-19 patients to generate a large and diverse collection of antibodies targeting multiple different regions of the receptor-binding domain of the SARS-CoV-2 spike protein. Two papers describing the creation of REGN-COV2 and its anti-viral activity have been accepted for publication in Science.
- The REGN-COV2 clinical program will consist of four separate study populations: hospitalized COVID-19 patients, non-hospitalized symptomatic COVID-19 patients,

uninfected people in groups that are at high-risk of exposure and uninfected people with close exposure to a COVID-19 patient. The placebo-controlled trials will be conducted at multiple sites. The first two adaptive Phase 1/2/3 studies are evaluating REGN-COV2 as a treatment for hospitalized and non-hospitalized patients with COVID-19. The Phase 1 portion will focus on virologic and safety endpoints, and the Phase 2 portion will focus on virologic and clinical endpoints. Data from the Phase 1 and Phase 2 studies will be used to refine the endpoints and determine size for the Phase 3 studies.

- [NCT04425629](#) is a master protocol assessing the safety, tolerability, and efficacy of anti-spike (S) SARS-CoV-2 monoclonal antibodies for the treatment of ambulatory patients with COVID-19.
- [NCT04426695](#) is a master protocol assessing the safety, tolerability, and efficacy of anti-spike (S) SARS-CoV-2 monoclonal antibodies for the treatment of hospitalized patients with COVID-19.

In other news about COVID-19 interventions:

On June 5, 2020, [AbbVie, Harbour BioMed, Utrecht University and Erasmus Medical Center](#) **announced they entered into a collaboration** to develop a novel antibody therapeutic to prevent and treat COVID-19.

- The collaboration will focus on developing 47D11, a human, neutralizing antibody 47D11 targeting the conserved domain of the SARS-CoV-2 spike protein that was recently [reported in Nature Communications](#).

On June 9, 2020, [AstraZeneca](#) **announced they have licensed coronavirus-neutralizing antibodies from Vanderbilt University**, and plan to advance a pair of these mAbs into clinical development as a potential combination therapy for the prevention and treatment of COVID-19. This agreement builds on the Company's collaboration agreement with Vanderbilt, announced in April 2020.

On June 9, 2020, it was reported that the [Ministry of Health of the Russian Federation](#) **registered anti-IL-6R levilimab** (BCD-089, trade name IIsira), intended for the treatment of severe COVID-19. Developed by Biocad, levilimab received state approval in Russia through a fast-track mechanism.

Antibody News You Should Know

June 15 - July 1, 2020

Updates on non-COVID-19 interventions

Preclinical development

On June 17, 2020, [Lassen Therapeutics announced it has secured \\$31 million in Series A financing to develop antibodies](#) as potential treatments for fibrosis, rare diseases and oncology. Lassen acquired human anti-IL-11R monoclonal antibodies from CSL Limited and is working in partnership with FUJIFILM Diosynth Biotechnologies to accelerate its anti-IL-11R program.

- The lead candidate is LASN01, a monoclonal antibody targeting IL-11 receptor alpha.

First clinical studies

On June 18, 2020, [Seattle Genetics, Inc. announced dosing of the first patient](#) in a Phase 1 clinical trial (NCT04254107) evaluating SEA-TGT, also known as SGN-TGT, for patients with solid tumors and lymphomas. They also announced the dosing of the first patient in a Phase 1 clinical trial (NCT04389632) evaluating SGN-B6A in patients with advanced solid tumors.

- SEA-TGT/ SGN-TGT is a nonfucosylated human IgG1 antibody targeting T-cell immune receptor with Ig and ITIM domains (TIGIT), an inhibitory immune receptor.
- SGN-B6A is an antibody-drug conjugate (ADC) targeting integrin beta-6, which is overexpressed in numerous solid tumors and has been demonstrated to be a negative prognostic indicator across a diverse range of cancers.

Details for a [first-in-human, Phase 1/2 study \(NCT04441099\) of NBE-002](#), an anti-ROR1 ADC, in patients with advanced solid tumors were posted on June 22, 2020. The study will evaluate the recommended dose for further clinical development, safety, tolerability, anti-tumor activity, immunogenicity, pharmacokinetics and pharmacodynamics of NBE-002. This study is not yet recruiting patients.

- Developed by NBE-Therapeutics AG, NBE-002 is an anthracycline-based immune-stimulatory ADC targeting ROR1.

Details for a [first-in-human, open-label, multi-center, Phase 1/2, dose-escalation study \(NCT04442126\) with expansion cohorts to evaluate NM21-1480](#) for safety and immunogenicity, to determine the maximal tolerated dose and recommended Phase 2 dose,

define the pharmacokinetics, to explore the pharmacodynamics, and to obtain preliminary evidence of the clinical activity in adult patients with selected advanced solid tumors were posted on June 22, 2020. This study is not yet recruiting patients.

- Developed by Numab Therapeutics AG, NM21-1480 is a trispecific anti-PD-L1/anti-4-1BB/anti-human serum albumin single-chain Fv fusion protein.

On June 22, 2020, **Heat Biologics, Inc. announced that the first patient has been treated in their first-in-human Phase 1 clinical trial evaluating PTX-35**, the first antibody product candidate developed by Heat Biologics' Pelican Therapeutics subsidiary. NCT04430348 is a Phase I, first-in-human, dose-escalation study to evaluate the safety of PTX-35 in patients with advanced solid tumors refractory to standard of care.

- PTX-35 is a humanized monoclonal antibody that is a functional agonist of human T-cell co-stimulator, TNFRSF25.

On June 24, 2020, **Grid Therapeutics, LLC announced that the first patient has been dosed in a Phase 1/2 study (NCT04314089) of GT103** in patients with refractory non-small cell lung cancer. The study will enroll an estimated 24 patients and has an estimated primary completion date of June 2022.

- GT103 is an IgG3 therapeutic antibody derived from single B cells of cancer patients.

On June 25, 2020, **Tizona Therapeutics, Inc. announced today that its Investigational New Drug application for the anti-HLA-G antibody TTX-080** has been cleared by the U.S. Food and Drug Administration (FDA). The first clinical study of TTX-080 will be initiated in advanced cancers in Q3 2020.

- By blocking the interaction of HLA-G with its receptors, TTX-080 prevents the suppression of both innate and adaptive immune activity and has the potential to enhance anti-tumor responses.

Regulatory review update

On June 19, 2020, **GlaxoSmithKline plc announced the US FDA will convene a meeting of the Oncologic Drugs Advisory Committee (ODAC) to review data supporting the company's Biologics License Application) for belantamab mafodotin** for the potential treatment of patients with relapsed or refractory multiple myeloma who have received at least four prior therapies including an immunomodulatory agent, a proteasome inhibitor and an anti-CD38 antibody. The ODAC will meet virtually on July 14, 2020.

- Belantamab mafodotin is a humanized ADC targeting B-cell maturation antigen.



New developments in COVID-19 interventions

The Antibody Society, in partnership with the Chinese Antibody Society, is closely tracking over 140 programs involving the development of recombinant protein therapeutics, mostly monoclonal antibodies, as COVID-19 interventions. While some are intended to ameliorate symptoms of the disease, such as elevated levels of cytokines or abnormal clotting, more than 80 directly target SARS-CoV-2 and block its entry into cells.

Details can be found in our [online searchable Tracker](#).

News announced during June 15 - July 1, 2020 include:

On June 16, 2020, **YUMAB announced the first financing round of its spin-off CORAT Therapeutics GmbH** to advance the development of anti-SARS-CoV-2 antibody drug candidates. CORAT Therapeutics will continue the pre-clinical development of the lead antibody drug candidate to potentially begin clinical development by the end of 2020.

- The candidates are human anti-SARS-CoV-2 antibodies with neutralizing activity against live SARS-CoV-2.

On June 29, 2020, **IMMUNOPRECISE ANTIBODIES LTD. announced the discovery of functional anti-SARS-CoV-2 antibodies** from humans and llama, which were identified using the company's phage display technology. Numerous lead candidate antibodies with highly potent

neutralizing activity in vitro were identified. The company anticipates pre-clinical studies will begin summer 2020.

- Additional anti-SARS-CoV-2 antibodies derived from rabbit and OmniAb® rat campaigns are also undergoing functional screens.

On June 16, 2020, [Monopar Therapeutics Inc. and NorthStar Medical Radioisotopes, LLC announced a 50/50 collaboration to develop potential radio-immuno-therapeutics to treat the symptoms of severe COVID-19](#) caused by aberrantly activated immune cells that release pro-inflammatory cytokines. The companies aim to develop Monopar Therapeutics Inc.'s MNPR-101 monoclonal antibody, along with a proprietary portfolio of related monoclonal antibodies. MNPR-101 will be coupled to a therapeutic radioisotope supplied by NorthStar.

- MNPR-101 is a preclinical stage, humanized antibody targeting urokinase plasminogen activator receptor.

On June 15, 2020, [Edesa Biotech, Inc. announced they received expedited approval from Health Canada to begin a Phase 2/3 clinical study that will evaluate EB05](#) as a potential treatment for moderate to severe COVID-19 patients. The company is seeking government grants to accelerate the initiation and rollout of the study. The randomized, double-blind, placebo-controlled Phase 2/3 Study (NCT04401475) will evaluate the safety and efficacy of EB05 + standard of care (SOC) vs. placebo + SOC in adult hospitalized patients with moderate to severe covid-19 pneumonia.

- EB05 is a humanized IgG1 antibody targeting toll-like receptor 4. As NI-0101, the mAb was originally developed by NovImmune SA as a potential treatment for rheumatoid arthritis.

Details of a [Phase 3 randomized, double-blind, placebo-controlled study \(NCT04452318\) assessing the efficacy and safety of REGN10933+REGN10987](#) in preventing SARS-CoV-2 infection in household contacts of individuals infected with SARS-CoV-2 were first posted on June 30, 2020. An estimated 2000 patients will receive subcutaneous administration of the mixture of antibodies. The estimated study primary completion date is April 11, 2021.

- REGN10933+REGN10987 are anti-Spike SARS-CoV-2 monoclonal antibodies.