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Bay Area

In Oakland, white priest sees racism in Catholic Church and fights against it. B1

Fourth weekend of protests since death of George Floyd. B1

San Francisco Chronicle

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CORONAVIRUS CRISIS: 100 DAYS

Progress in testing, hurdles remain

By Catherine Ho and Cynthia Dizikes

Much of what we know about the coronavirus has been revealed by testing: who has it, how widespread it is and where hot spots are. And testing enables contact tracing, a crucial public health tool that helps prevent small clusters of cases from becoming large outbreaks.

Yet our understanding of the pandemic and how best to control it is hamstrung by the fundamental limitations of testing.

Only a fraction of those believed to be infected with the virus have had their diagnosis confirmed by testing. Testing cannot catch all asymptomatic cases, since many people without symptoms never seek testing unless they work in high-risk locations like hospitals, nursing homes or prisons, where employees are tested regularly. And both kinds of tests — diagnostic, which determines if someone is infected with the virus, and antibody, which verifies a past infection — are fallible, with research showing some problems with false negatives and false positives.

We've come a long way with testing since the beginning of shelter-in-place 100 days ago, when California lagged behind other populous states in per capita testing. But there is still much left to do across the state. Here are four milestones we've reached, and four obstacles we

Control continues on A8

Coronavirus update

As of 9:45 p.m. Sunday

Carlos Avila Gonzalez / The Chronicle

Coronavirus survivor John Marble avoided overnight hospitalization for the disease. Even so, he called it the worst health experience of his life.

Waging battles that won't end

Search for key to beat virus

Bay Area at center of many promising treatment studies

By Peter Fimrite and J.D. Morris

The frenetic search for the miracle that will rid the world of COVID-19 is branching out in a thousand directions, and a large part of the microbial treasure hunt is going on in the Bay Area, where major progress has been made in the 100 days since residents were ordered to shelter in place.

Scientists at universities, laboratories, biotechnology companies and drug manufacturers are combing through blood plasma taken from infected patients for secrets that will help them fight the disease.

The key is likely a super-strength antibody found in some patients. But researchers must first figure out how those antibodies work and how they can be harnessed and used to stop the many health problems associated with COVID-19, particularly acute respiratory distress syndrome, or ARDS, which has killed more people than any other complication connected to the disease.

Other developments showing promise include injections of mesenchymal stem cells, found in bone marrow and umbilical cords, that doctors are studying to battle inflammation caused by ARDS. And a steroid called dexamethasone reduced the number of deaths by halting the overreactive immune responses in

BAY AREA

19,472 cases | **531** deaths

CALIFORNIA

178,095 cases | **5,512** deaths

UNITED STATES

2,279,879 cases

119,969 deaths

Source: Chronicle research, county health departments and Johns Hopkins University

Being a survivor of the coronavirus doesn't mean you've recovered.

In the months since the virus first crept into the Bay Area, more than 500 people have died and more than 17,500 others have positively tested for the virus. For the rest, the prospect of getting sick looms large.

Now, after 100 days in — as most counties in the Bay Area have begun to open up — it can feel like the air is looser, that the worst part is over. But those who dealt with the virus say they haven't necessarily defeated it, and their lives will never be the same.

The Chronicle interviewed eight coronavirus survivors who had a variety of experiences. **Their stories, A6-A7**

Online extra
Hear their stories in their own voices: **www.sfchronicle.com/coronavirus-survivors**

Special report: This week marks 100 days since the Bay Area began sheltering in place. What have we learned in that time? And what does the future hold for our region and the fight to contain COVID-19?

seriously ill patients in the
Drugs continues on A9

Inside

Online

» Get all of The Chronicle's coronavirus coverage, including stories from day one of the 100 Days series: **www.sfchronicle.com/coronavirus**

Weather
Low clouds, then sun.
Highs: 63-97.
Lows: 51-61.
D4

Movement to sever ties with school police builds

By Jill Tucker

Michael had a history of fighting at school, so officials asked a campus police officer to meet with the boy. The situation quickly turned violent, with Michael kicking the armed officer, who then cuffed the boy's hands and feet with zip ties before putting him in the back of a squad car and citing him for battery.

Michael was 5. A kindergartner.

The 2011 incident in Stockton involving a small African American boy is one of countless cases across California that have spurred more than a decade of activism to eliminate police in schools, a movement with relatively little momentum — until now.

The recent protests against police brutality have pushed education officials in the Bay Area and across the country to eliminate agreements with police, which in many cases include paying uniformed and armed officers to patrol campuses or provide security on school grounds. At the same time, school officials in California

Schools continues on A5

Michael Short / Special to The Chronicle

Jessica Black marches down Broadway with other protesters last week in support of restorative justice for Black and brown youths.

CORONAVIRUS CRISIS: 100 DAYS

Bay Area center of promising virus studies

Drugs from page A1

United Kingdom.

In all, more than 130 vaccines and 220 treatments are being tested worldwide.

What follows is a list of some of the most promising elixirs, medications and vaccines with ties to the Bay Area:

Antibodies and immunity

Monoclonal antibodies / Vir Biotechnology, San Francisco: Scientists at Vir and several institutions, including Stanford and UCSF, are studying monoclonal antibodies, which are clones of coronavirus-fighting antibodies produced by COVID-19 patients.

The idea is to utilize these "neutralizing antibodies" — which bind to the virus' crown-like spikes — and prevent them from entering and hijacking human cells.

Only about 5% of coronavirus patients have these super-strength antibodies, and those people are believed to be immune to a second attack.

The trick for scientists at Vir is to identify these neutralizing antibodies, harvest, purify and clone them. If they succeed, the resulting monoclones could then be used to inoculate people and — it is hoped — give them long-term immunity against the coronavirus. The company recently signed a deal with Samsung Biologics, in South Korea, to scale up production of a temporary vaccine in the fall after clinical trials are complete.

Another monoclonal antibody, leronlimab, is being studied in coronavirus clinical trials by its Washington state drugmaker, CytoDyn. The company's chief medical officer is in San Francisco, and the company that does laboratory tests of leronlimab is in San Carlos.

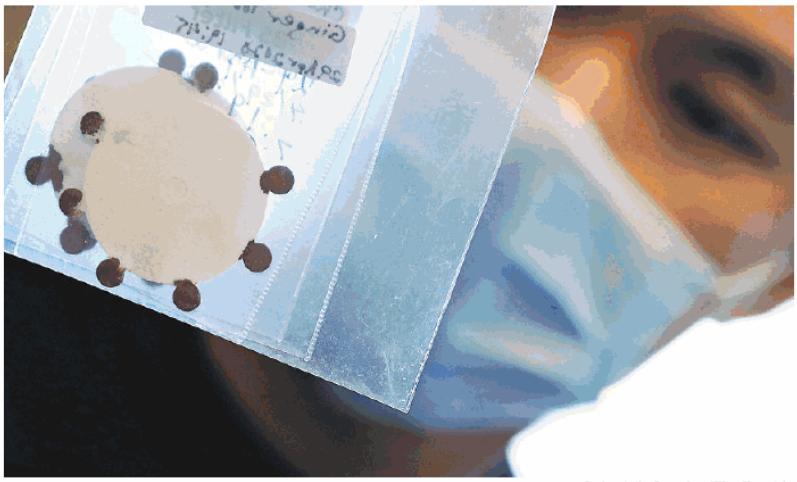
Interferon-lambda / Stanford University: Doctors at Stanford are running a trial to see if interferon-lambda, which is administered by injection, helps patients in the early stages of COVID-19. Interferon-lambda is a manufactured version of a naturally occurring protein that has been used to treat hepatitis. Stanford doctors hope it will boost the immune system response to coronavirus infections.

Dr. Upinder Singh, a Stanford infectious-disease expert, said the trial has enrolled more than 50 patients and is halfway finished. "We have noted that patients tolerate the drug very well," she said.

Mesenchymal stem cells / UCSF and UC Davis Medical Center: UCSF Dr. Michael Matthay is leading a study about whether a kind of stem

Santiago Mejia / The Chronicle

UCSF health care workers test for COVID-19 in the Mission District in a study of 5,700 people to learn how the virus spreads.



Carlos Avila Gonzalez / The Chronicle

Graduate student Marcus Wong looks over a sample that was sent to determine test kit usability for a random East Bay COVID-19 antibody evaluation in a research lab at UC Berkeley.

Antiviral drugs

Remdesivir / Gilead Sciences (Foster City): Remdesivir, once conceived as a potential treatment for ebola, was the first drug to show some promise in treating COVID-19 patients. The drug interferes with the process through which the virus replicates itself. A large study led by the federal government generated excitement in late April when officials said hospitalized patients who received remdesivir intravenously recovered faster than those who received a placebo.

A later study looking at

versity): This antiviral drug, developed in 2014 by a subsidiary of the Japanese film company to treat influenza, is undergoing numerous clinical studies worldwide, including a Stanford University trial that began this month. Unlike remdesivir, it can be administered orally, so it can be used to treat patients early in the disease, before hospitalization is necessary.

Stanford epidemiologists want to see if favipiravir, which has shown promising results in other trials, prevents the coronavirus from replicating in human cells, halts the shedding of the virus and reduces the

of certain proteins, and researchers hope that it will reduce lung complications and prevent deaths from COVID-19. About 6,000 patients are receiving colchicine or a placebo during the clinical trial, dubbed Colcorona, which began in March and is expected to be completed in September.

Selinexor / Kaiser Permanente: Kaiser hospitals in San Francisco, Oakland and Sacramento are studying selinexor, an anticancer drug that blocks a key protein in the cellular machinery for DNA processing, as a potential COVID-19 treatment. The drug has both

in mucous membranes. The hope is that the newly fortified membranes will prevent the virus from entering the body.

"It's the only vaccine (candidate) that activates the first line of defense, which is the mucosa," said Andrei Floroiu, Vaxart's chief executive, noting that intravenous vaccines kill the virus after it is inside the body. "Our vaccine may prevent you from getting infected at all."

The drug was effective against influenza and norovirus in trials and appears to work on laboratory animals, Floroiu said. He expects trials of VXA-COV2-1 on humans to begin later this summer.

VaxiPatch / Verndari (Napa and UC Davis Medical Center): Napa vaccine company Verndari makes a patented adhesive patch that can deliver a vaccine instead of a shot. Now, the company is trying to make a vaccine for COVID-19 that they can administer through that patch. At UC Davis Medical Center in Sacramento, Verndari researchers are developing a potential vaccine that relies on the coronavirus' spike-shaped protein. When injected into a person, the substance would ideally train their body to recognize the virus and fight it off without becoming ill.

A spokeswoman told The Chronicle that the company's preclinical tests have shown "early, positive data in developing an immune response." Verndari hopes to move into

cell found in bone marrow can help patients with ARDS. Matthay hopes that the stem cells can help reduce the inflammation associated with some of ARDS' most dire respiratory symptoms, and help patients' lungs to recover.

Matthay is aiming to enroll 120 patients in San Francisco, the UC Davis Medical Center in Sacramento and hospitals in a handful of other states. He said the trial, which includes a small number ARDS patients who don't have COVID-19, should have results within a year. So far 17 patients are enrolled in the trial, most of them in San Francisco.

A later study looking at dosage showed some benefit for moderately ill COVID-19 patients who received remdesivir for five days, but improvement among those who got it for 10 days was not statistically significant. Gilead, a drug company, recently announced that it will soon launch another clinical trial to see how remdesivir works on 50 pediatric patients, from newborns to teenagers, with moderate to severe COVID-19 symptoms. More than 30 locations in the U.S. and Europe will be involved in the trial, the company said.

Favipiravir / Fujifilm Toyama Chemical (Stanford Uni-

severity of infection. The Stanford study, the only outpatient trial for this drug in the nation, is enrolling 120 people who have been diagnosed with COVID-19 within the past 72 hours. Half of them will get a placebo. People can enroll by emailing treatcovid@stanford.edu.

Anti-inflammatory drugs

Colchicine / UCSF (San Francisco and New York): The anti-inflammatory drug commonly used to treat gout flare-ups is being studied in the U.S. by scientists at UCSF and New York University. The drug short-circuits inflammation by decreasing the body's production

antiviral and anti-inflammatory properties, and it's administered orally, according to Kaiser's Dr. Jacek Skarbinski. The trial aims to enroll 250 patients with severe symptoms at Kaiser and other hospitals that are participating nationwide.

Vaccines

VXA-COV2-1 / Vaxart, South San Francisco: The biotechnology company Vaxart is testing this drug to see if it is as effective at controlling COVID-19 as trials have shown it to be against influenza. VXA-COV2-1, the only potential vaccine in pill form, uses the genetic code of the coronavirus to trigger a defensive response

the next phase of testing in the coming weeks and start clinical trials in humans this year.

If the vaccine is proved effective and safe, patients could receive it through the mail, according to company CEO Dr. Daniel Henderson. The patch would leave a temporary mark on the skin that patients could photograph and send to their doctor as proof they have taken the vaccine, Henderson has said.

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involve residents and workers at nursing homes and other residential care facilities for the elderly. And while a few California counties, including San Francisco, recently began requiring nursing homes to test all residents and staff, the vast majority have not. As of June 17, just 21% of the state's 1,223 nursing homes — 256 sites — had submitted the results of baseline testing for their residents and workers, according to the state department of public health, which requires all such facilities to complete baseline testing by the end of June.

2. Limits to testing technology. A diagnostic test can capture only one moment in time, and it's difficult to pinpoint the perfect time to test. Some people test negative, then positive, then negative — all within a few days. This is because virus levels fluctuate throughout the course of infection. Getting tested too early, before the virus is circulating at levels high enough to be detected in a test, can generate a false negative result.

3. Antibody testing obstacles. Antibody tests are supposed to reveal whether a person has been exposed to the coronavirus. Although the U.S. Food and Drug Administration cracked down on sales of shoddy tests, some still have accuracy issues. They also can't reveal whether a person is immune to reinfection.

4. Public data on testing is insufficient and inconsistent. The daily testing numbers reported by the state don't include where tests are being done, or demographic information on who is being tested. The lack of details makes it difficult for the public to easily understand whether certain groups are being missed. County-level testing data is also inconsistent between jurisdictions.

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Paul Chinn / The Chronicle

Kate Shepherd directs a driver after collecting a coronavirus test sample at Oakland's Henry J. Kaiser Convention Center.