Seattle researchers building 'biobank' of patients' blood to unlock the mysteries of the new coronavirus

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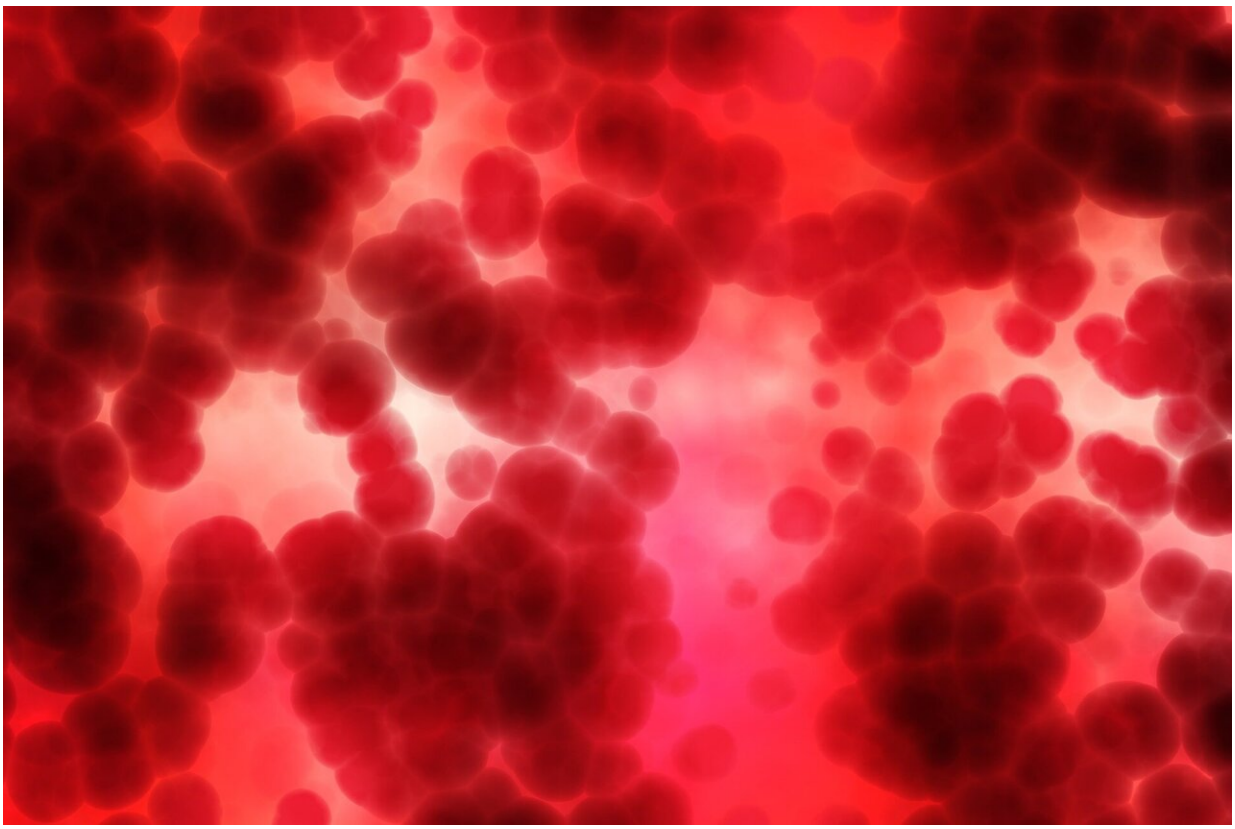

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Blood and other biological specimens from COVID-19 patients treated in Seattle area hospitals are helping scientists build a massive "biobank"

to examine the virus's long-term impacts on the human body and why it affects some people more severely than others.

Disease doctors and researchers hope to use what they learn from the data to help figure out what drugs and therapies are most effective in treating those sick with COVID-19 and to aid other scientists in the quest to develop a vaccine against it.

"We don't yet understand exactly what this virus is doing to individuals—what organs it's attacking and why it affects people differently," said Dr. Jim Heath, president of the Institute for Systems Biology (ISB), a Seattle-based biomedical research firm that is teaming with Swedish Health Systems on one of the studies. "So, our goal really is to take these extremely deep dives into how it's affecting a couple hundred patients or more and really track their disease trajectories over time."

Scientists with the Swedish/ISB study, largely funded by the federal Biomedical Advanced Research and Development Authority and the pharmaceutical company Merck, so far have enlisted more than 50 patients, about a quarter of the number of people it hopes to eventually assess.

Volunteers are enlisted after seeking diagnosis and treatment for COVID-19 at four participating Swedish hospitals in the Seattle area. Blood and other specimens are collected at the time of diagnosis, and then three or four more times over the course of the illness for several weeks.

"We're measuring people throughout the spectrum, from mild infections to the severely and critically ill," said Dr. Jason Goldman, a Swedish infectious-disease physician who is co-leading the COVID-19 Immune Response Study with Heath.

A related study, headed by UW Medicine, so far has enrolled an additional 45 COVID-19 patients, with a primary focus on "the sickest of the sick" at Harborview Medical Center and two other intensive care units, said Dr. Mark Wurfel, a critical-care physician leading that research. The impacts of the disease on each patient are tracked from diagnosis through discharge, or in some unfortunate cases, death, he said.

"The hope is to understand as early as possible what's different about a critical patient. What might indicate potential targets for therapy and maybe even help us to be able to identify those who are on the path to bad outcomes?" Wurfel said.

Researchers are sharing data among the studies to draw from a broader group of patients with differing ages, genders, racial and ethnic backgrounds and medical histories, and are collaborating with scientists around the country. The UW Medicine research, which is partly funded by the nonprofit CDC Foundation, is also part of a national consortium of groups collecting and pooling such COVID data, Wurfel added.

The studies in Seattle are loosely designed to allow scientists to change their focus and explore areas of interest that emerge in what's been a rapidly changing research landscape during the pandemic.

"It's all over the map," Heath said. "We're really trying to piece together the story about this infection on the fly."

Although it's still early, the research already has surfaced promising leads.

Part of the initial focus has compared how different patients' immune systems respond to the virus, with a particular focus on how one type of white blood cells, called T cells, react to defend the body against

COVID-19.

That research requires special processing of blood cells to keep them alive and reviewing them quickly. Scientists then build a library of the various virus-specific T-cell groups detected in blood sampled from various patients. The research has resulted in a preprint article with observations of two patients—two men, one his 30s and another in his 70s—that's now awaiting peer review.

"One of the things we're seeing is the T cells are pretty dysfunctional in their response," Heath said. "Although we can say that there are some common characteristics within patients about how T cells see and react to the virus, there are also big differences. They're kind of not working as well as we think they should be."

The observations, which consider differences in ages, medical histories, drug treatments and other factors, has helped to identify common infection-fighting proteins with strong responses to the virus at various stages of the illness. "And that could be useful for scientists when they're trying to design a vaccine," Goldman said.

Researchers also have started collecting and examining tissue samples taken during autopsies of deceased COVID-19 patients—a study area that initially was stymied by a shortage of personal protective equipment (PPE).

"We always knew it would be useful to get those tissues, but when we launched our study, the lack of PPEs was really scary," Heath said. "But that's changed over the last couple weeks."

One surprising early observation from researching tissues of an older patient was the extent the coronavirus had attacked the lymphatic system, the network of tissue and organs that purge the body of toxins

and waste and transport disease-fighting fluids.

"It's known that the part of the lymph system to avoid viral infections diminishes with age," Heath said. "So, this may be a really big clue to why older people respond more severely (to COVID-19) than younger people."

Goldman and Heath each cautioned the autopsy research is still preliminary and ongoing, however.

Researchers are also interested in studying how patients are responding differently to various treatments and therapies, Wurfel said.

"There's still a fair amount of differences from physician to physician in treating COVID-19, but a lack of data to really guide what therapies are effective," he said.

Beyond what the data and analysis ultimately reveal, the studies already have had a positive impact on some patients, Goldman said.

"Some of our volunteers have told us they felt helpless in their hospital rooms," he said. "Being able to participate in a study that might lead to something much bigger for the good of society makes them feel good, and it's been really beautiful to hear."