National Nanotechnology Day 2020

A nanoscale view of the pandemic

On 10/9, taking measure of COVID-19 challenges and solutions

October 9 is National Nanotechnology Day—the day that celebrates the potency of the world at the scale of one nanometer, 10^{-9} or one billionth of a meter.

Every year, we celebrate 10/9 to shine a light on the potential of nanoscale discoveries and innovations to build a better world. This year a tiny virus measuring just nanometers in size holds the world in its grip. To mark Nano Day 2020, therefore, we're sharing a nanometer-sized window into the pandemic.

The scale at which the COVID challenge originates is the same scale from which its solutions will emerge. Today, across MIT and in the laboratories of MIT.nano, scientists and doctors, engineers and innovators, students and scholars are using their understanding of the nanoscale to make a difference *right now*.

With our wishes for a happy—and healthy—Nano Day, below are some of the ways that MIT is helping to make sense of the pandemic and to blunt its effects, one nanometer at a time.

1×10^{-9}

One billionth of a meter—the size of a single nanometer.

80 nanometers

Approximate diameter of a single SARS-CoV-2 virus particle.

How does the coronavirus work?

6,000–9,000 nanometers

Approximate diameter of a typical human lymphocyte, a type of white blood cell.

MIT research on white blood cells and COVID-related sepsis.

7 – 9 nanometers

Approximate thickness of a cell membrane.

9 – 12 nanometers

Length of the protein spikes on the outside of a coronavirus particle.

9,000 nanometers

Approximate diameter of type II pneumocytes cells, found in the lungs.

MIT researchers identify cells likely targeted by COVID-19.

300 nanometers

Size of test particles that must be 95-percent screened out by an N95 mask.

MIT testing whether uncertified N95 masks are effective.

23 – 27 feet

Distance a cloud of airborne droplets can travel after a sneeze.

Turbulent Gas Clouds and Respiratory Pathogen Emissions.

508,000 nanometers

Thickness of a single-piece, self-assembled face shield designed at MIT.

MIT COVID-19 Face Shield at Project Manus.

2.5 million

Number of MIT COVID-19 face shields capable of being manufactured per week.

0.44 nanometers

Size of a single ethanol molecule.

80 percent

Concentration of ethanol in hand sanitizer produced by the MIT Environmental Health and Safety Office (EHS).

Making hand sanitizer for front-line campus workers.

10

Number of projects funded by the MIT-IBM Watson AI Lab aimed at using artificial intelligence to tackle the pandemic.

Marshaling artificial intelligence in the fight against COVID-19.

1 nanoliter

Size of droplets tested in CRISPR-based diagnostic chips developed by MIT.

Microfluidics chips that can run thousands of tests simultaneously.

15 minutes

Potential speed of a new rapid COVID test that resembles a pregnancy test.

Faster diagnosis.

2,989,344

Number of COVID-19 tests processed since March 25 by the Broad Institute of MIT and Harvard.

COVID-19 Diagnostic Processing Dashboard.

40 nanometers

Size of a virus-like folded-DNA structure that could form the basis of a COVID-19 vaccine.

Engineers use "DNA origami" to identify vaccine design rules.

13 nanometers

Approximate length of hemagglutinin protein that coats viruses.

A step toward a universal flu vaccine.

515,000 nanometers

Exterior diameter of a 25-gauge needle used in a flu vaccination.

100%

Level of effort by MIT faculty, researchers, and students to develop systems and solutions to prevent, diagnose, and treat COVID-19.

42

Number of people on the MIT.nano staff working hard every day to support the MIT community in this effort.