Global vaccines shortages are pushing scientists to revolutionize manufacturing practices and shift from growing viruses in giant vats to cultivating them in long, thin tubes. By some estimates, only around 1 percent of people in low-income countries have received one COVID-19 shot and each year only 5 billion doses of vaccines of every type are produced worldwide, according to experts convened by the London-based think tank Chatham House. They noted that scaling up shots for COVID-19 is proving difficult. That is a grave concern, because the pandemic has underscored the need for technology that can dramatically boost global vaccine manufacturing capacity.

Viruses can’t be grown on their own. They need host cells in which to grow and multiply. In many cases, companies use cells as tiny factories to churn out the vaccine product. But growing enough cells, in the giant steel tanks can take weeks compared to just couple of days required to process the virus and make the actual vaccine. The problem is that about 80 percent of the time you’re just sitting on your hands. You’re not actually making a virus because you’re just growing up host cells.

One team of scientists believes they’ve found a solution by manufacturing vaccines in a 300-meter-long tube rather than a vat.

There are quality-control advantages to continuous vaccine manufacturing, explains Keith Roper, who heads the department of biomedical engineering at the Utah State University. A giant vat of cells can only make good vaccine product for a defined period before it begins to peter out and make subpar product.

But continuous vaccine manufacturing is fueled by a constant supply of cells, growth ingredients, and viral material. He likens batch-based vaccine manufacturing to plugging into a battery, which loses power over time, whereas continuous manufacturing is akin to hooking into the power outlet. “If you plug your electronic device into an outlet, our distributed national power grid is a continuous source of electricity, whether you plug it in at 8 a.m. or 5 p.m., whether you plug it in yesterday or tomorrow, you expect that that source of electricity will be steady and
continuous and operate within a pretty well-defined range,” Roper says.

Smaller, more affordable vaccine production machinery could mean more countries could have local vaccine production plants, it gives countries more agency to control their own destiny. Engineers and developers say that efficient manufacturing would eventually benefit all vaccines. The world witnessed a flurry of innovation in creating COVID-19 vaccines, and now there’s a push to carry that innovation into the manufacturing process.

Read the full National Geographic article here.

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