



Overcoming 'Injectability Bottleneck' With New Syringe



In an article published in *Advanced Healthcare Materials* (Jayaprakash et al. 2020), MIT researchers describe the development of a simple, low-cost technology for subcutaneous injection of high-concentration drugs.

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The technology comes in the form of a new double-barrelled syringe that greatly widens the range of injectable concentrations or biologic formulations – also known as biologics – which are typically diluted and injected intravenously.

Biologics are powerful drug formulations but their high viscosities means these concentrations cannot be administered with the use of conventional syringes and needles. The new MIT invention provides a solution to this "injectability bottleneck," allowing subcutaneous injection of high-concentration vaccines and drugs to treat diseases "more easily," according to Kripa Varanasi, MIT professor of mechanical engineering and one of the study authors.

Amidst the COVID-19 pandemic, Varanasi notes, being able to stay home and subcutaneously self-administer medication to treat diseases such as cancer or auto-immune disorders is very important.

With the double-barrelled syringe, the viscous formulation to be injected is surrounded with a lubricating fluid to ease the drug's flow through the needle. This lubrication technique helps to reduce the required injection force, such that just one-seventh of the injection force was needed for the highest viscosity tested, the MIT team explains.

"Regardless of how viscous your drug is, you can inject it, and this is what made this approach very attractive to us," says study first author Vishnu Jayaprakash, a graduate student in MIT's mechanical engineering department.

For example, therapeutic gels – used in bone and joint therapies, as well as for timed-release drug delivery, among other uses – can now be more easily administered using the MIT-developed syringe.

Self-administration of drugs or vaccines, as noted by Professor Varanasi, is one way to democratise access to healthcare.

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Published on : Wed, 26 Aug 2020