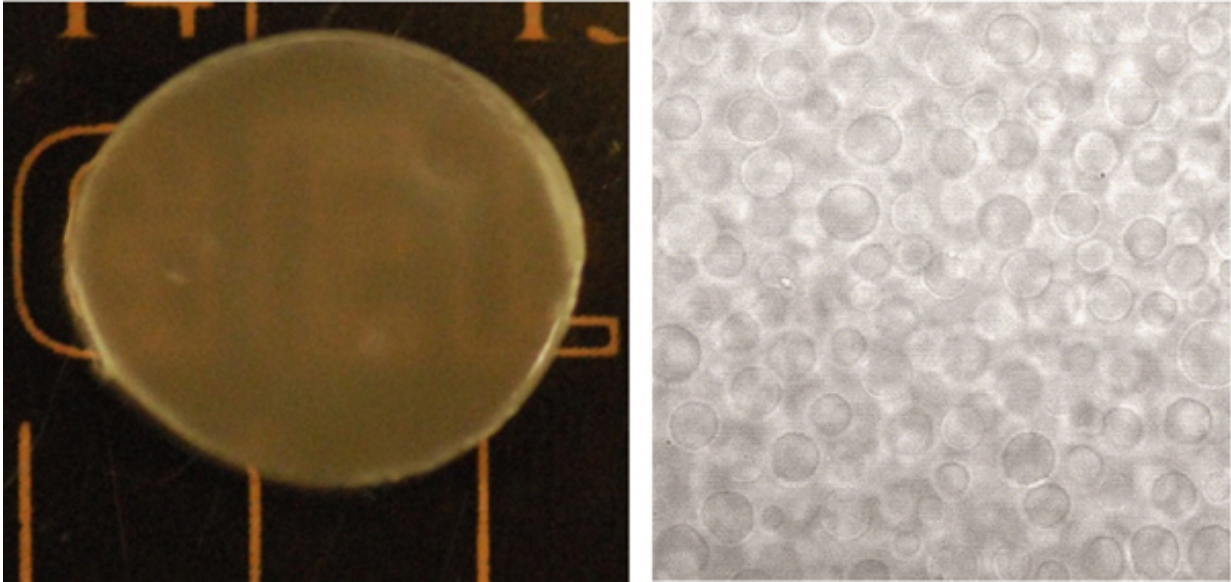


# A gel that can make drugs last longer

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Photograph (left) and optical microscopic (right) images of the hydrogels with polyethylene glycol microstructures. Credit: A\*STAR

Researchers at the Institute of Bioengineering and Nanotechnology (IBN) of A\*STAR have developed a drug-delivering hydrogel to treat chronic diseases such as hepatitis C, a liver disease that kills around 500,000 people worldwide every year.

"The new gel from IBN prevents premature [drug release](#) in the body. This allows for long-term drug delivery and reduces the side effects from frequent [drug administration](#). We hope that our solution can

improve the treatment and well-being of patients suffering from chronic diseases such as [hepatitis C](#)," said IBN Executive Director Professor Jackie Y. Ying.

The standard treatment for [chronic hepatitis C](#) infections includes a weekly injection of a protein drug called PEGylated interferon. The frequent injections increases patient discomfort, is time-consuming, and can cause depression and fatigue.

Previously, it had not been possible to use hydrogels to deliver drugs with long-term efficacy because controlling the drug release rate is difficult. Most hydrogels have a porous structure, which will cause the encapsulated drugs to leak prematurely and be eliminated rapidly from the body.

The researchers led by IBN Team Leader and Principal Research Scientist Dr Motoichi Kurisawa have found a way to regulate the drug release rate and duration by creating a gel with 3D [microscopic structures](#) of a polymer compound called polyethylene glycol (PEG) that resembles "reservoirs".

These microscopic structures function as a "reservoir" for the PEGylated interferon drugs, because of the presence of the PEG compound on the drugs. This property prevents the contents from leaking prematurely. The drugs will also flow in and out of the many "reservoirs" in the gel before it is released out to the body. This helps to slow down the drug diffusion rate. The duration of the drug action can also be controlled by changing the size of the microscopic structures.

The study by the IBN researchers showed that a one-time administration of the hydrogel containing the PEGylated interferon medication was as effective as eight injections of the medication alone, and that the effect of the drugs can last up to two months. The hydrogels will degrade

naturally and be eliminated from the body once the drugs are fully released.

"Our hydrogels can significantly extend the half-life of hepatitis C drugs by up to 10 times longer than current treatment. Half-life is the time taken for the amount of drugs in the body to be reduced by half, and is a standard indicator of the duration of [drug](#) action. This work improves the therapeutic efficiency of the drugs, while reducing the need for frequent injections," said Dr Kurisawa.

The study was recently published in the leading journal, *Biomaterials*, and conducted in collaboration with the Institute of Molecular and Cell Biology of A\*STAR.

Up to 150 million people globally suffer from chronic hepatitis C infections according to the World Health Organization. "I believe that our method can pave the way for more effective and safe treatment of hepatitis C. We are also testing the microstructured gel for the treatment of other [chronic diseases](#) besides hepatitis C," added Dr Kurisawa.

**More information:** "Microstructured Dextran Hydrogels for Burst-Free Sustained Release of PEGylated Protein Drugs," *Biomaterials*, (2015) [DOI: 10.1016/j.biomaterials.2015.06.008](https://doi.org/10.1016/j.biomaterials.2015.06.008)

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