

# Nanogels

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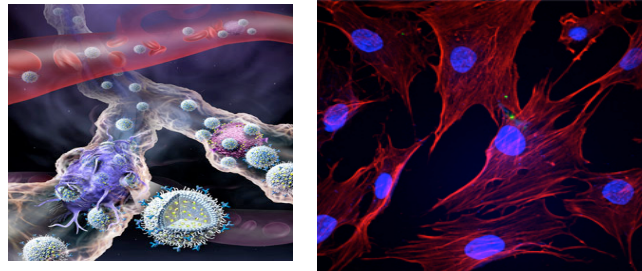
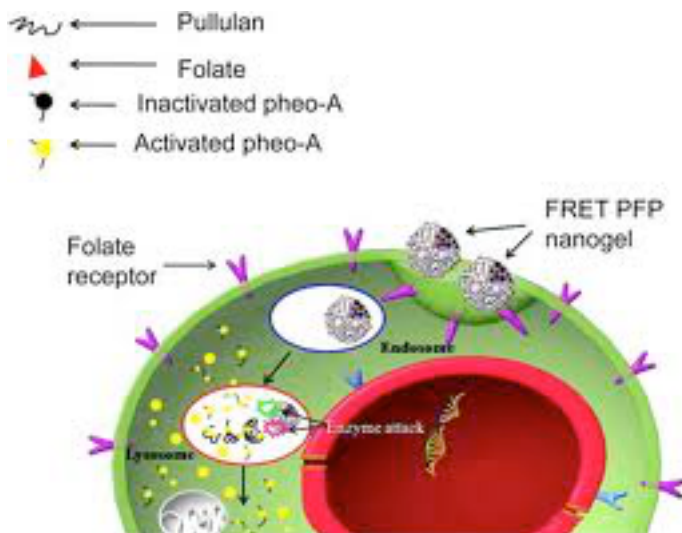
**Abstract**—Drug delivery in the human body, majorly consist of orally taking the drug and then it travels to the small intestine where it is absorbed into the blood stream. But the small intestine dissolves much of the drug before it actually reaches the destination. Nanogels are highly stable, microvessels made of organic matter that coat the drug. They allow for the drug to circulate longer in the body and pass biological barriers that drugs with out the gels can not.

## I. INTRODUCTION

Drugs have been used in science to improve health and extend lives dating back thousands of years. But it wasn't until the 20<sup>th</sup> century that vast improvements in pharmaceutical drug technology have occurred. Drugs work in the body, starting by a variety of ways. But the main way for pharmaceutical drugs to be put into the system is through oral ingestion. It is a relatively slower process because it does not travel directly into the blood stream and to the brain, but it's the simplest way. As drugs are orally ingested they interact with other systems as they make their way to the small intestine. As the drug is being absorbed, it travels to the liver through the portal vein and the liver then metabolizes the drug. This interaction causes some of the drug to be dissolved before being absorbed into the blood stream, rendering it ineffective. Once in the blood stream the drug is distributed through out the body to its targets. With this knowledge, nanogels are in the process of being created so that the drug does not interact with any part of the body other than its target. Also the nanogel can allow for slow distribution of the drug, keeping it in the system for as long as necessary.

## II. METHODS

Scientists currently at Yale have created spherical nanogels using atom transfer radical polymerization. The nanogels are approximately 200 nanometers in diameter and have a mesh coating that interacts with the polymers of the cells that it is targeting. Once interaction occurs the mesh coating dissolves slowly releasing the drug into the specified cell.



## RESULTS

Stated by Tarek Fahmy, associate professor of biomedical engineering at Yale, "Nanogels have a clear and promising future" (Scitechdaily). This can be seen in the animal testing that is being done on lupus prone mice. Lupus is a systematic dysfunction where the body attacks itself. Scientists have used nanogels to slowly deliver the drugs necessary to keep the mice alive. It has proven to increase life by three months. Which in comparison to humans is around 8 years. Comparing this to conventional therapies, the biodegradable nanogels have proven more effective at delivering drugs to specific cells, also lower amounts of the drugs are needed because they are not depleted by the liver due to the lining the nanogel creates. On top of this, this new drug delivery system works with out depleting the white blood cells in the body, thus leaving patients bodies able to fight for themselves. All of the results look promising, but this delivery system has not been tried in humans yet.

## IV. DISCUSSION

Nanogels would allow patients with autoimmune diseases such as HIV/AIDS who have to take daily medication to only take their pills every month or so. Since the layer coating the drug protects the drug from being absorbed where it is not meant to be and allows it to not be broken down, the drug can be taken and small amounts be delivered by that drug over time. Also the drugs will only be delivered where they are needed, limiting the side effects that the drugs have on the patient. With the use of FDA approved materials for the nanogel, the process of getting this drug approved may be quicker than expected. Thus patients lives can be extended and there will no longer be daily struggles of remembering to take ones pills. This new technology looks promising and will hopefully extend lives.

## REFERENCES

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- [2] <http://scitechdaily.com/nanogels-provide-a-new-way-to-attack-lupus/>
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