Group 1 Nano-particles + Covid Presentation

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Types of Nanoparticles Used

One group of nanoparticles that may be able to help are polymeric, lipid-polymer hybrid, chitosan, among other types of nano particles because they have been successfully used in vaccines for other coronaviruses such as MERS-CoV and SARS-CoV. They would engineer the nanoparticles to resemble the virus in physiochemical properties. Also, research has shown that copper is a more effective nanoparticle in terms of preventing SARS-CoV-2 compared to steel and plastic. Although copper is effective in damaging viral RNA, it may also be toxic when inhaled through a mask. These copper nanoparticles range from 1-100nm in size.

Application of the nanoparticles

With the outbreak of Covid-19, nanotechnology became increasingly useful due to its unique physicochemical properties and controlled nano-bio interactions. The major problem related to Covid-19 were, obviously, the number of fatalities caused by this virus. Thanks to nanoparticles, they were now able to combat a large number of these fatalities caused by late-stage cytokine storms, by enhancing stability of a specific target, prolonging retention, as well as being used as potential therapeutic use.

What exactly did the nanoparticles do?

This paper detailed the potential uses of Silver (Ag) NPs, just like the ones we used in our lab last week, could be modified and "manicured" to utilize their magnetic properties for things like air filtration. These properties are in some ways seen as anti-microbial or anti-bacterial. Specifically, the nano particles can create chains of Corona Virus offspring. Incapacitating their ability to enter the cell. See part C of figure 1 on the next slide pulled from the paper.

Diagram

Potential nanoparticle applications for prevention, diagnosis, and treatment of COVID-19

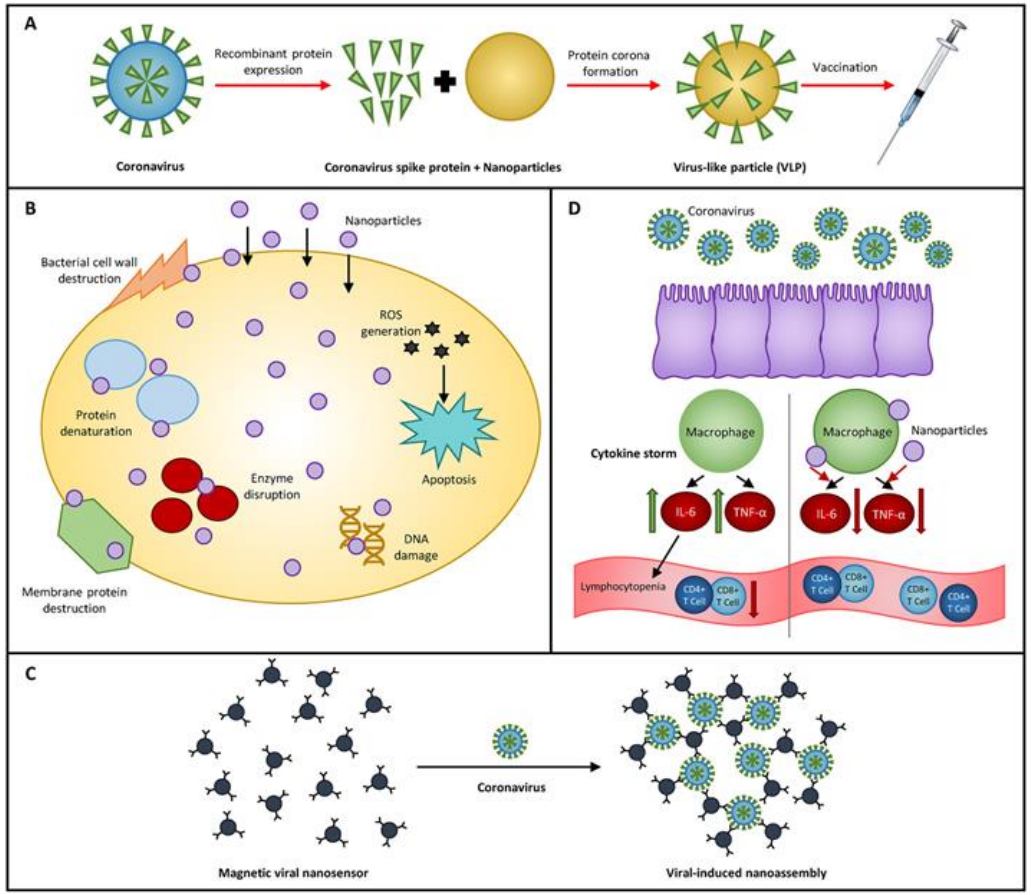

Figure 1. How nano particles cane be used to combat the spread of Covid-19[1]

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How does this improve upon the current technology for this application?

The grand reason why a mRNA vaccine was produced rather than a traditional vaccine in response to the recent covid outbreak, was because of its sheer advantages, both economically and timely.

Traditional vaccines have been in the process of being replaced with mRNA vaccines, a different, more straightforward and effective style of vaccine that teaches our cells how to make a protein designed to fight off the disease instead of directly giving our cells a dosage of the drug. As well as one that has a more effective & efficient production and distribution in the lab. The problem was however, how to make these vaccines effective in their transfer of information into the subject.

Because messenger-RNA is very susceptible to degradation to its nucleic acid, the use of lipid nanoparticles, have aided in the delivery of its mRNA information into the cytoplasm of its subject very effectively.

How does this improve upon the current technology for this application?

These lipid nanoparticles provide a faster and easier process to produce doses of vaccines, partly due to the extensive research done in the recent years by the scientific community that have expressed the popularity in the substance

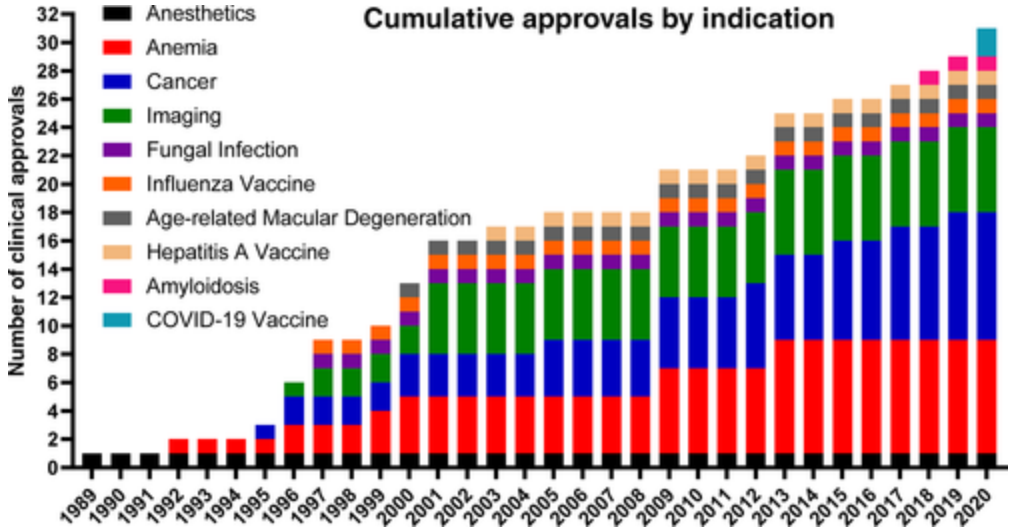
And as a result, the widely known Pitzer and Moderna BioNTech vaccines consists of a variety of lipid nanoparticles that aid in its delivery of mRNA Being one of the first mRNA vaccines to have been approved by the FDA

The role of lipid nanoparticles as mRNA delivery vehicles for combating covid 19 made rise for the unprecedented increase of its popularity even more throughout 2020-2021

And since 2019, 35 new nanoparticle technologies have entered clinical trials most of which regarding covid 19

Currently, the influence of lipid nanoparticles have caused them to be approved and tested for diseases yet to be cured such as cancer & anemia

How does this improve upon the current technology for this application?



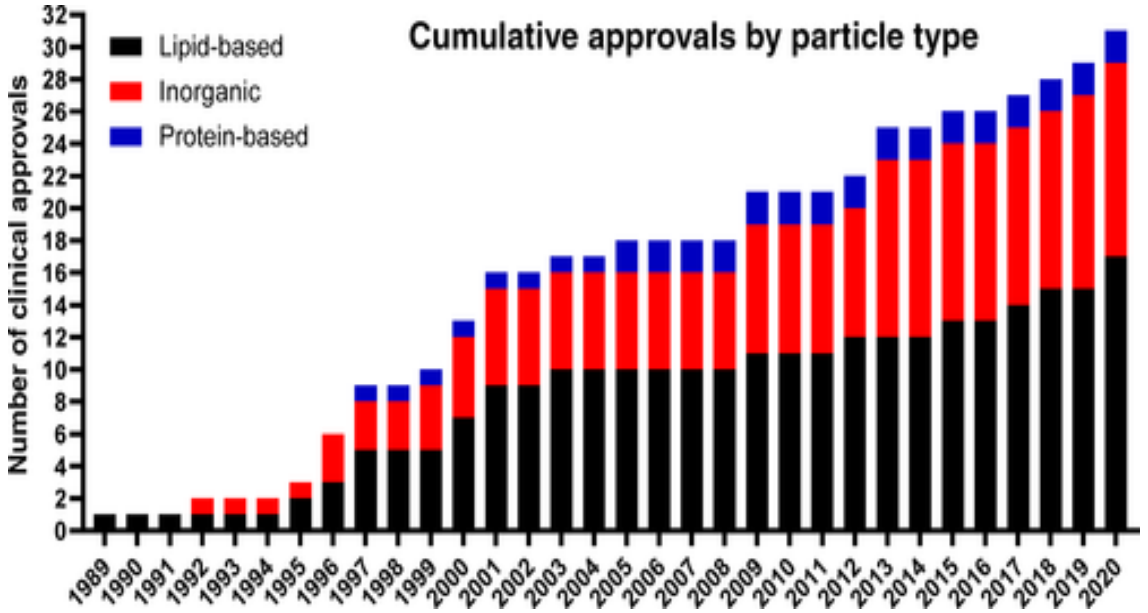
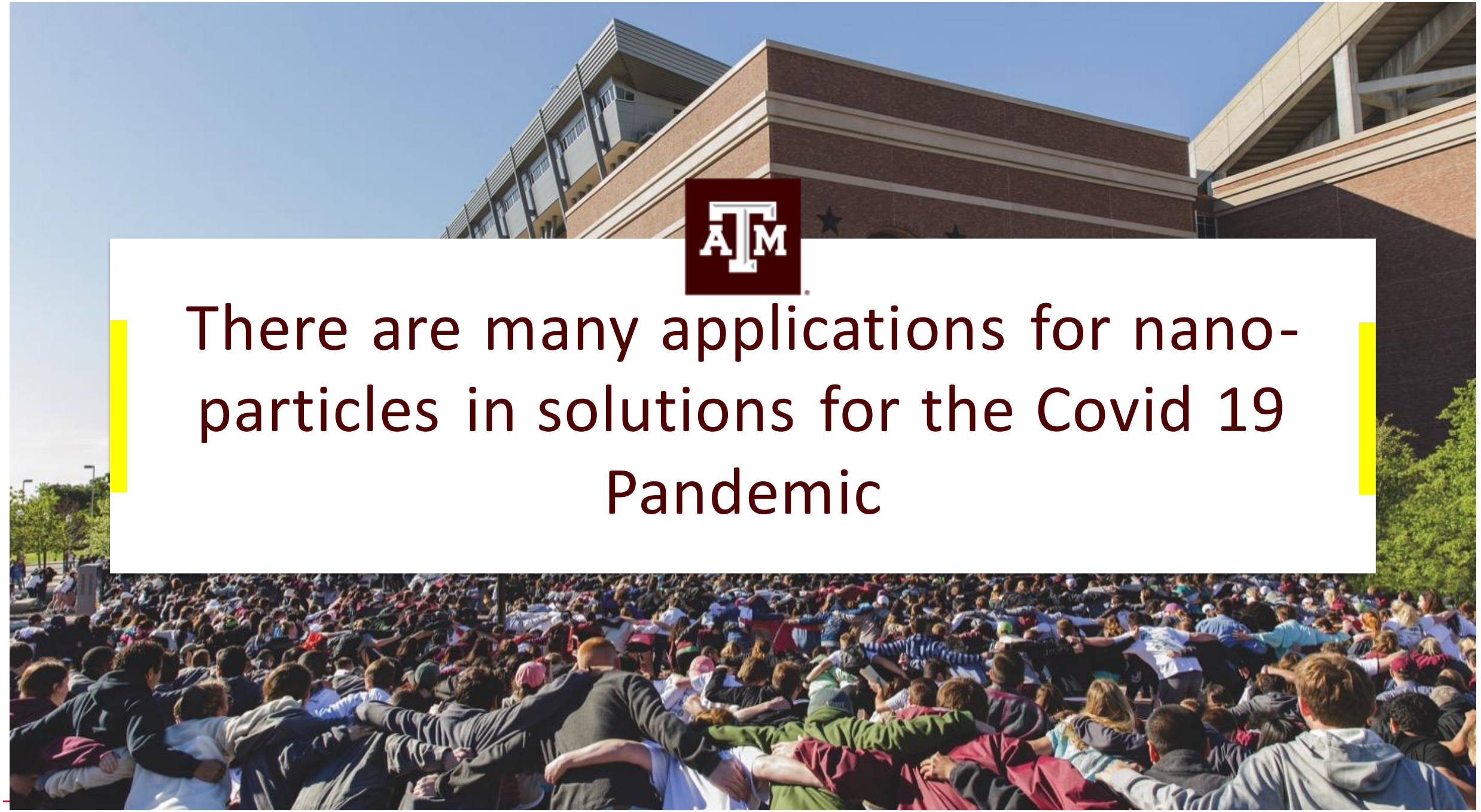


Figure 2,3. How nano particles usage have increased according to approval rate

References

[1]Kusumoputro, S, Tseng, S, Tse, J, et al. Potential nanoparticle applications for prevention, diagnosis, and treatment of COVID-19. *VIEW*. 2020; 1:20200105. https://doi-org.srv-proxy1.library.tamu.edu/10.1002/VIW.20200105

[2]Shibboleth authentication request. (n.d.). Retrieved November 11, 2022, from https://aiche-onlinelibrary-wiley-com.srv-proxy2.library.tamu.edu/doi/10.1002/btm2.10246



There are many applications for nano-particles in solutions for the Covid 19 Pandemic