

Will You Eat GMO Tomatoes As Coronavirus Vaccine?

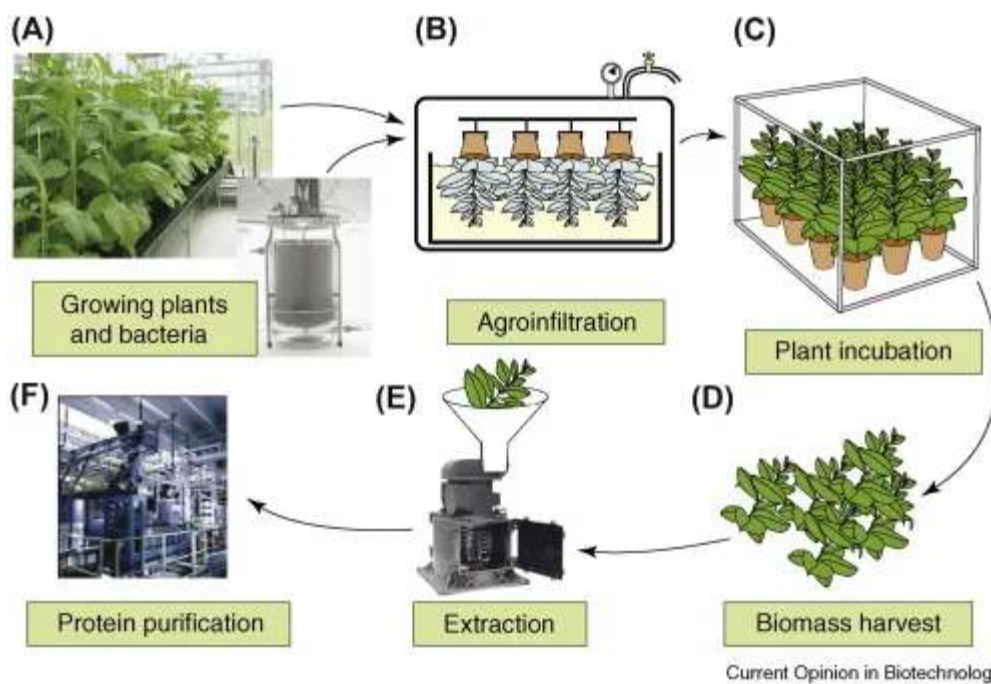
After [AI robots for enforcing mandatory face mask](#) rules and [vaccination history based digital identity](#), now scientists in Mexico are growing [genetically modified tomatoes as edible coronavirus vaccine](#). A research group at a Mexican university is using bioinformatics and computational genetic engineering to identify candidate antigens for a vaccine that can be expressed in tomato plants. Eating the fruit from these plants would then confer immunity against COVID-19.



Scientists Are Growing Genetically Modified Tomatoes As Edible Coronavirus Vaccine

Plants as Biofactories for Vaccines

A lesser-known approach to produce antigens and vaccines on a large scale is the use of plants as biofactories. The plants are genetically modified (Figure 1) to produce, for example, virus-like-particles (VLPs), which are structural proteins of the virus, or “multi-epitope” proteins, where different sequences of an antigen allow us to generate an immunizing and protective response in humans.



*Figure 1. General scheme for recombinant protein production in plants using agroinfiltration: The recombinant protein/antigen expression cycle takes 6–10 days starting with agroinfiltration of grown plants and *Agrobacterium* culture (A). Agroinfiltration is accomplished by submerging plants in bacterial culture harboring plasmid vectors coding for gene of interest and subjecting them to vacuum pulse to force the bacterial culture in (B). Plants are incubated for several days (C) and harvested (D) by strictly controlled protocol designed to prevent the release of genetically engineered bacteria into the environment. Subsequently, the extraction of recombinant proteins is carried out (E) and the purification to make the recombinant drug or vaccine (F). Source: Pharmacognosy, 2017*

At the beginning of 2020, [97 experimental vaccines](#) had been obtained with this methodology, including plant-grown antigens for HIV, polio, hepatitis B, rabies, HPV, cholera and tuberculosis, among other pathogens.

Genetically Modified Plant based Vaccine

Since the 1990s, several research groups have worked on the [modification of edible plants and fruits](#) that generate an immune response in the intestinal epithelium of animals after oral intake (Figure 2). Genetically modified crops – still at the experimental, not commercial, level – used to create “[edible vaccines](#)” range from potato, tomato, lettuce, papaya, carrot and rice to quinoa, alfalfa, banana and algae. They have focused on hepatitis B, rotavirus, Norwalk virus, malaria, cholera and autoimmune diseases, among others.

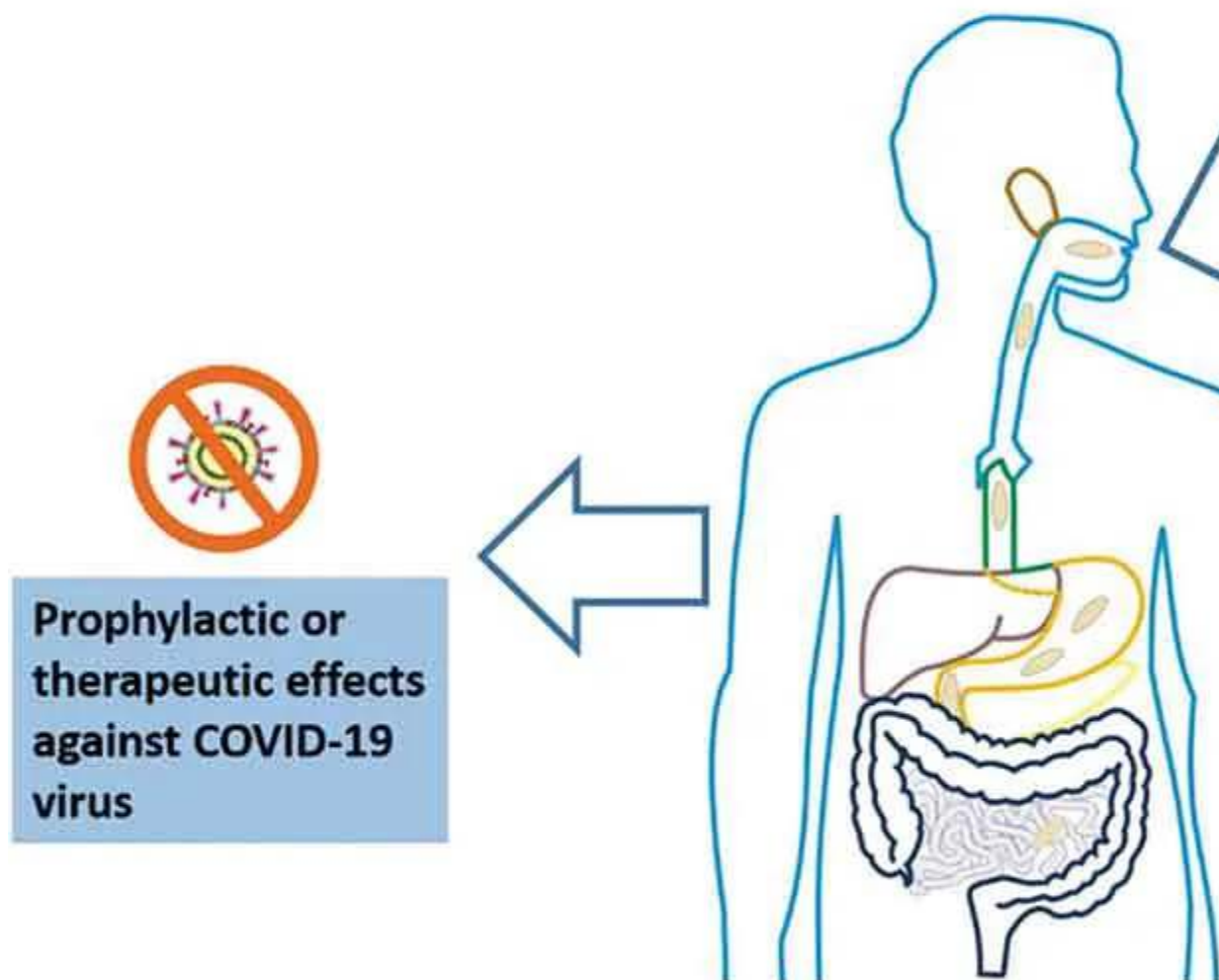
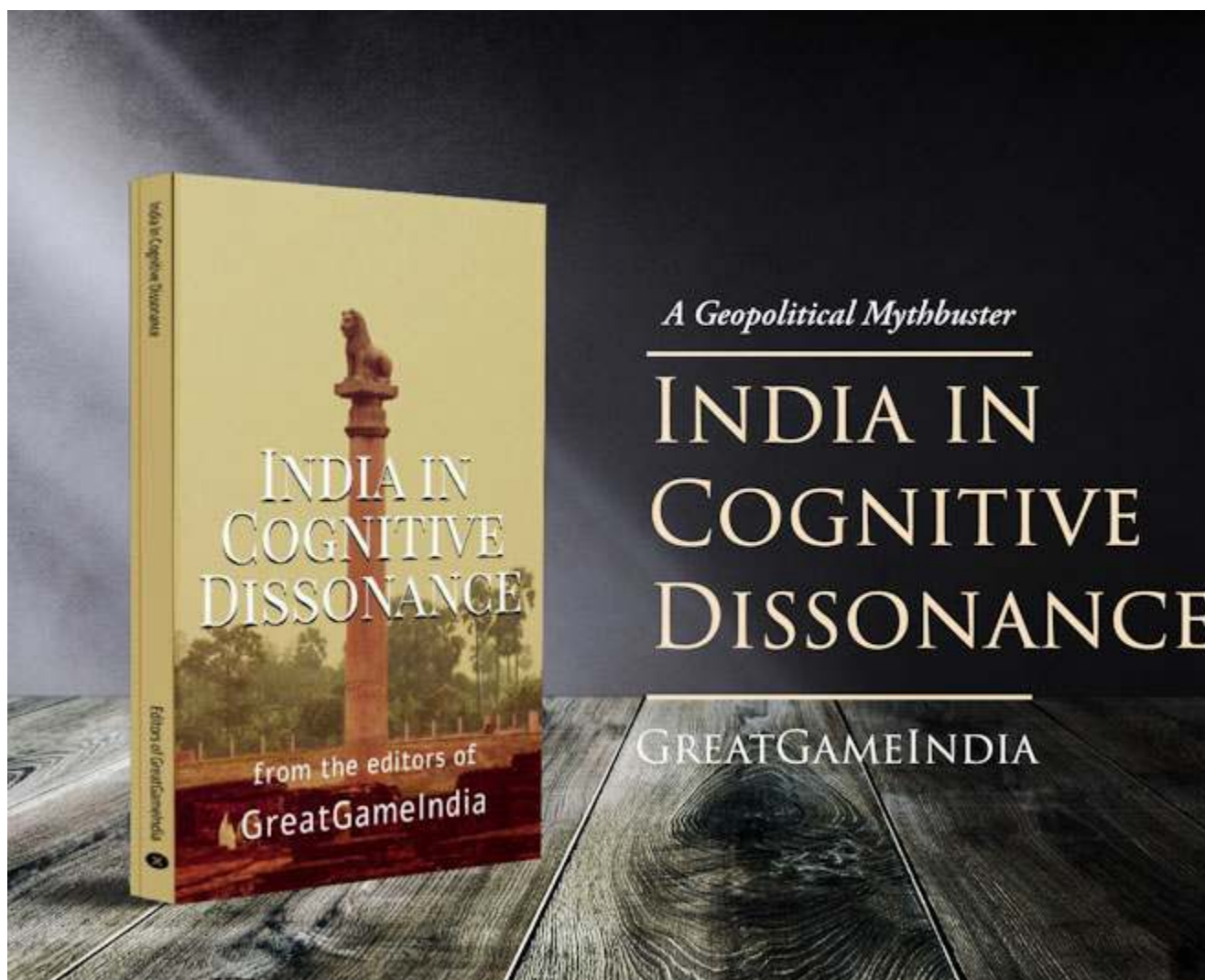


Figure 2.- Developmental paths for the production of plant-made antibodies or vaccines against SARS-CoV-2 virus. Transient transformation approaches allow high protein yields in the transformed plants, which are processed to purify the target biopharmaceutical and obtain injectable vaccines or monoclonal antibodies. Stable genetic transformation technologies applied in edible plant species can render oral vaccine formulations (e.g. capsules or tables containing freeze-dried leaves). Source: Rosales-Mendoza, 2020

Genetically Modified Tomatoes as edible Coronavirus Vaccine

The idea of GMO tomatoes as edible coronavirus vaccine was chosen by Daniel

Garza, a young bio-technologist and entrepreneur with a research stay at the Institute of Biotechnology of the Autonomous University of Nuevo León (UANL) in Mexico. In [an interview](#) with Cornell Alliance for Science, he said,



“The development of an edible vaccine against SARS-CoV-2 has so far been a little-explored alternative, even though the benefits are evident. Under this premise, this problem would be addressed with the focus of developing a fusion protein with the characteristics of a vaccine to be expressed in tomato plants.”



Daniel Garza García at UANL Institute of Biotechnology (2019)

Regardless of the effectiveness of the GMO vaccine, there is also a [problem of legislation](#) as GMOs are banned in many nations. Only 26 nations currently have [regulations implemented for the commercial use](#) of GMOs.

“Given the current contingency situation for the COVID-19 we are experiencing, it will undoubtedly make us rethink the legislation of the GMOs that apply not only in Mexico but in Latin America,” Garza noted.

“What is currently happening allows us to rethink whether we are really capable as countries of being able to face a pandemic of such magnitude without using the full potential that GMOs offer us for the development of vaccines, especially for developing countries ...

The benefits of biotechnology must be shown to society not as an evil, but as an effective solution to many of the problems that we currently have in the region.”

Under the push for a GMO vaccine, already the European Union has [suspended GMO regulations](#) to fast-track COVID-19 vaccine.

[#TrustStamp](#) funded by [#BillGates](#) & implemented by Mastercard & GAVI will soon link your biometric digital identity to your vaccination records for predictive policing. Those who dont wish to be vaccinated maybe locked out of system based on trust score.<https://t.co/Gnzz87ODfS>

— GreatGameIndia (@GreatGameIndia) [July 19, 2020](#)

In response to this, the Consumer Choice Center’s senior policy analyst Bill Wirtz said he’s “puzzled by the change of heart” of members of the parliament, adding: *“If you had suggested anything of the sort six months ago, some lawmakers would have been furious.”*

As of now, the future prospect of this ongoing project is expression of the candidate

antigens in tomato and evaluating their immunogenic and protective capacity in animal models. As the research progresses, the companies or research centres will be working collaboratively to evaluate and bring the candidate vaccine to the clinical phase.

For latest updates on the outbreak check out our [Coronavirus Coverage](#).

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