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Plant-derived VLP: A worthy platform to produce vaccine against SARS-CoV-2

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Abstract:
After its emergence in late 2019 SARS-CoV-2 was declared a pandemic by the World Health Organization on 11 March 2020 and has claimed more than 2.8 million lives. There has been a massive global effort to develop vaccines against SARS-CoV-2 and the rapid and low cost production of large quantities of vaccine is urgently needed to ensure adequate supply to both developed and developing countries. Virus-like particles (VLPs) are composed of viral antigens that self-assemble into structures that mimic the structure of native viruses but lack the viral genome. Thus they are not only a safer alternative to attenuated or inactivated vaccines but are also able to induce potent cellular and humoral immune responses and can be manufactured recombinantly in expression systems that do not require viral replication. VLPs have successfully been produced in bacteria, yeast, insect and mammalian cell cultures, each production platform with its own advantages and limitations. Plants offer a number of advantages in one production platform, including proper eukaryotic protein modification and assembly, increased safety, low cost, high scalability as well as rapid production speed, a critical factor needed to control outbreaks of potential pandemics. Plant-based VLP-based viral vaccines currently in clinical trials include, amongst others, Hepatitis B virus, Influenza virus and SARS-CoV-2 vaccines. Here we discuss the importance of plants as a next generation expression system for the fast, scalable and low cost production of VLP-based vaccines.