RESEARCH

Of all the compounds from algae found to have antiviral effects, the most apparently promising is a compound known as Griffithsin, or GRFT.

GRFT exhibits no cytotoxicity in cells at concentrations high enough to have clinical significance as far as the treatment of viruses, which is an issue with many other compounds of interest from algae.

GRFT has been shown to inhibit the entry of SARS-CoV-1 into cells in a concentration-dependent manner.

Potential manners of administration for GRFT and other biopharmaceuticals include encasing the compounds include controlled release using encapsulation within nanoparticles.

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References

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APPLICATION OF ALGAL BIOTECHNOLOGY TO THE PRODUCTION OF THE COVID-19 VACCINE

Among other emerging methods for producing vaccines for the COVID-19 virus is the use of algae to produce compounds which can inhibit the virus’ ability to infect human cells.

Perhaps the most notable of these compounds is a lectin known as GRFT, which has successfully inhibited coronaviruses in previous studies.

Algae is important to consider as a means to producing the COVID-19 vaccine as well as other biopharmaceuticals because it has a relatively low impact on the environment and a considerably low cost to produce.

PROCESS DESCRIPTION

Producing antiviral compounds from algae is relatively straightforward – they require less trace nutrients, such as minerals, than many other organisms. Additionally, they can grow either photoautotrophically or heterotrophically, which means that they are able to adapt to the available carbon source, providing a cost-effective means of their cultivation.

Algae can be genetically modified using nuclear or organelle expression, meaning they can be made to produce more of a specific compound of interest, or even made to produce compounds that they normally would not.

Compared to other means of producing biopharmaceuticals, algae have a growth rate that is 5-10 times what is typical. Also, they result in a higher yield of sheer biomass, which can be used in other ways.

POTENTIAL IMPACT ON ECOSYSTEM SERVICES

There are several means by which the use of algae to produce biopharmaceuticals benefits the environment.

Firstly, algae are cultivated in aquatic environments, meaning that in order to cultivate them in mass there is not competition over land which needs to take place, such as in most agricultural practices.

Next, algae generate a relatively low amount of carbon dioxide compared to other means of pharmaceutical (and even biopharmaceutical) production.

Finally, algae are capable of thriving off of wastewater. This means that human wastewater which would otherwise be disposed of/treated at the cost of consumers could instead be used to produce biopharmaceuticals such as COVID-19 vaccines.

SENSITIVE UNIT

Unfortunately, many of the compounds of interest produced by algae are toxic to the algae in high concentrations. This is problematic because the algae must be genetically engineered such to produce large amounts of these compounds in order for them to be useful in the production of biopharmaceuticals.

Currently, the solution to this issue is the use of compounds to inhibit the production of toxic compounds of interest during the algae's growth phase (otherwise, the algae would produce enough of the compound to have toxic effects before the population reaches a useful size.) Once the growth phase has ended, exposure to the inhibitory compounds is ceased and production of the compounds of interest can begin during what is known as the expression phase.

This solution has the effect of maximizing production, despite the issues posed by the algae's sensitivity to certain compounds of interest.