

Endophytics, LLC

Bozeman, MT

PRESS RELEASE

February 26, 2014

For immediate release

Contact Info

Bryan Blatt, CEO

406 585 1122

Bblatt@Endophytics.com

Announcement:

Endophytics, LLC announces an advanced biofuel and green chemicals technology platform utilizing fungi.

Changing the way the world looks at the source of hydrocarbons for biofuels and sustainable green chemicals.

Endophytics, LLC recently announced their fungal biotechnology platform at the Harvesting Clean Energy Conference in Helena, MT. The technology is capable of producing a myriad of advanced biofuels and sustainable green chemicals from agricultural wastes using microscopic filamentous fungi. The fungi are capable of producing a range of high value molecules, which can be used to make everything from drop-in biofuels to green chemicals. The products are terpenoids, benzene derivatives, alcohols, esters, straight-chain and branched hydrocarbons, aldehydes, acids, ketones, and polyaromatic hydrocarbons. A myriad of fungi that perform these useful and important biological processes are in the collection of Endophytics, LLC.



Phil Madson, President/CEO KATZEN International, Dr. Gary Strobel and Bryan Blatt, CEO Endophytics, LLC seen here, February 6, 2014 at the Harvesting Clean Energy Conference, Helena, MT

The Technology

The rainforests of the world are considered important treasure troves of biodiversity by conservationists, biologists and environmentalists. Yet little has been forthcoming from the biodiversity of these forests that directly impacts the world human population or condition. Endophytics, LLC of Bozeman, Montana now announces that fungi, isolated from rainforest plants, can produce hydrocarbons that have enormous potential as fuels and green chemicals. The bioprospecting of these fungi from the forests has no impact on the forest itself, since the fungi are obtained from small twig samples and subsequently scaled up under laboratory and industrial circumstances.

The fuel molecules produced by these organisms can be blended with gasoline, diesel, and Jet A. These molecules are distinguished from current renewable fuels by their chemical composition, as they are aromatics rather than alcohols, making them most desirable as drop-in fuels for today's automobiles, trucks, trains, and airplanes since they are structurally related to the components of gasoline, diesel and jet fuel. The green chemicals produced by the organisms have known uses and worldwide markets which include plastics, fibers, and lubricants. Additionally, several of the molecules being produced have pharmaceutical, industrial and agricultural uses. Some of the fungal products made by Endophytics, LLC have been directly added to gasoline and diesel fuel and tested in engines, which functioned normally with complete success. Higher octane ratings in gasoline blends were observed, as well as reduced smoke output and increases in thermal brake horsepower in diesel engines.

Agricultural waste feedstocks, recycling carbon from nature

The most commonly used biofuel is ethanol made by the fermentation of sugar or starch precursors. As such the final product is not the most desirable one for gasoline engines. However, in the case of fungi, the products are obtained by a uniquely designed fermentation scheme that directly produces hydrocarbons from agricultural products and wastes including leaves, sugar beet pulp, corn stover, and sugar cane. The complete genetic sequencing of these endophytes by the Sandia National Labs/DoE has demonstrated that the organisms have hundreds of genes responsible for producing enzymes that degrade the complex carbohydrates found in agricultural wastes. At this point, based on laboratory testing, the technology appears to be economically feasible and Endophytics, LLC intends to proceed to pilot scale in 2014.

Combustion and gas emissions from Endophytics fuels

Recent testing has been conducted on cineole, a unique fuel molecule produced by an endophyte. Earlier studies have shown that it is completely compatible with gasoline engines. For instance, when blended with gasoline and used to fuel internal combustion engines, cineole has proven to significantly increase octane ratings and reduce greenhouse gas emissions. Blends of up to 70% cineole in gasoline and 40% cineole in

diesel fuel have been tested with positive results. In diesel engines, a blend of cineole has been shown to reduce smoke by 50%, while increasing thermal brake horsepower by 2.5%. Other fungal products have been tested by the Sandia labs in advanced homogeneous charge compression ignition (HCCI) prototype engines. Sandia scientists concluded in their 2013 report that the fungal technology that makes these fuel components is both useful and valuable.

Commercial Scale Fermentation Systems

Scale-up fermentation systems for the endophytic fungi are being developed in cooperation with KATZEN International, Inc. of Cincinnati, Ohio. Phil Madson, President and CEO of KATZEN, has been involved in the project from its inception. In Mr. Madson's words: "Upon being introduced to Dr. Strobel's science, we, at KATZEN International, knew immediately that we were seeing the future for green chemicals. For 6 decades, KATZEN has specialized in development of processing technology for commercial execution of inventions and discoveries. Dr. Strobel and Endophytics have discovered a true "game changer". KATZEN is committed to assisting Endophytics in the development of the extraordinary commercial potential of these unique discoveries." Endophytics, LLC personnel have collaborated with Mr. Madson and several KATZEN engineers in the development of a number of advanced approaches to the fermentation of these unique fungi. Due to the unique metabolic nature of these organisms, several critical advances have been made that have increased the conversion rate of the feedstocks.

The Organisms: IP and DNA Sequencing

Recently, Endophytics, LLC has been granted initial claims on the fungal processes of making hydrocarbons by the US patent office. In addition, other applications for additional fungal strains are pending approval. A number of specific genetic pathways for the production of unique enzymes that synthesize desirable molecules have been identified. Some of the hydrocarbon products of these endophytes respond to epigenetic control, and methods are known to influence these processes. It has also

been learned that products from the host plant alter the output of volatile compounds by the fungi. As a result, Endophytics, LLC will begin strain improvement of one or more fungi in 2014. The increase in output of hydrocarbons by the fungal organisms of desired molecules combined with one or more efficient fermentation systems will make major scale-up and commercialization a possibility.

2014 goals and beyond

Interested individuals and companies are encouraged to contact Endophytics, LLC to learn more about their technology.
