Press Release

DEINOVE TEAMS UP WITH MBI, PIONEER OF AFEX TECHNOLOGY, TO EVALUATE ITS PROCESS ON INDUSTRIAL BIOMASS

- **Having demonstrated the value of DEINOL technology on model substrates (glucose/xylose), DEINOVE is now proceeding to test the technology with industrial biomass.**
- **U.S.-based MBI is in the process of scaling up a transformational biomass pretreatment technology, called AFEX. AFEX is designed to be a sustainable, economically viable source of pretreated biomass for food, feed, fuel, and other biorefinery applications.**
- **Preliminary Deinove lab results have demonstrated that Deinococcus assimilates over 95% of the sugars present in AFEX pretreated biomass and efficiently converts these sugars into ethanol, they represent an important step forward on the road to commercial production.**

Montpellier, 15 October 2014 - DEINOVE (Alternext Paris: ALDEI) and MBI have announced the formation of a technological partnership designed to demonstrate the effectiveness of the DEINOL technology for producing biofuels based on lignocellulosic biomass (2G biofuels).

MBI is both a premier multidisciplinary center sought out by industry partners for its unique derisking capabilities and a not-for-profit inspired by a mission to enhance quality of life. MBI applies its derisking approach to the development of biofuels, chemicals, food, and feed from renewable, rather than fossil, raw materials and is known for its exceptional record of successful university and corporate collaborations, including major industrial groups such as DuPont, Cargill (NatureWorks), Novozymes; and multiple start-ups such as Genomatica, OPX Biotechnologies, and Verdezyne.

MBI, in close collaboration with Michigan State University (MSU), has developed a transformational technology, called AFEX. This technology has the potential to double worldwide output from existing grain-crop production while providing a sustainable, affordable source of food, feed, fuels, and chemicals. AFEX has advanced from the laboratory to a one-ton-per-day pilot scale. Earlier this year, President Barack Obama and Secretary of Agriculture Vilsack gave recognition to the enormous global potential of this technology with a visit to MBI.

EARLY TEST RESULTS

After testing its process on simple sugars such as glucose and xylose, DEINOVE contacted MBI to test the DEINOL technology on AFEX pretreated corn stover.

Indeed, DEINOVE's commercial acceleration is relying on an increased focus: working on customizing *Deinococcus* strains for industrial biomass.

Preliminary tests produced remarkable results with the assimilation of more than 95% of all the sugars available in the biomass and the production of ethanol, a process called "Simultaneous Saccharification and Fermentation." These results demonstrate the effectiveness of AFEX technology in releasing the cellulose and hemicellulose found in the biomass, and the effectiveness of *Deinococcus* in assimilating and metabolizing the material obtained.

"The preliminary results obtained by combining AFEX and Deinococcus not only confirmed the performance of each one of our technologies," said Allen Julian, MBI's Chief Business Officer**,** "*but also demonstrated a compelling synergy between both." The results obtained so far confirm the extraordinary fermenting capabilities of Deinococcus bacteria, as well as their significant potential for product cost reduction. This combination is highly promising, and it could provide an answer for an industry that is seeking a technologically and economically competitive solution to the challenge of producing sustainable, low-cost biofuels."*

"The outlook for demonstrating the viability of our process with MBI is very exciting," said Emmanuel Petiot, CEO of DEINOVE. *"MBI is an expert in the development, optimization, and scale-up of biobased technologies, and it has provided support for the industrialization of many production technologies in the fields of green chemistry and biofuels. Once this test campaign is finished, we will have everything we need to move on to industrial production application with our partners."*

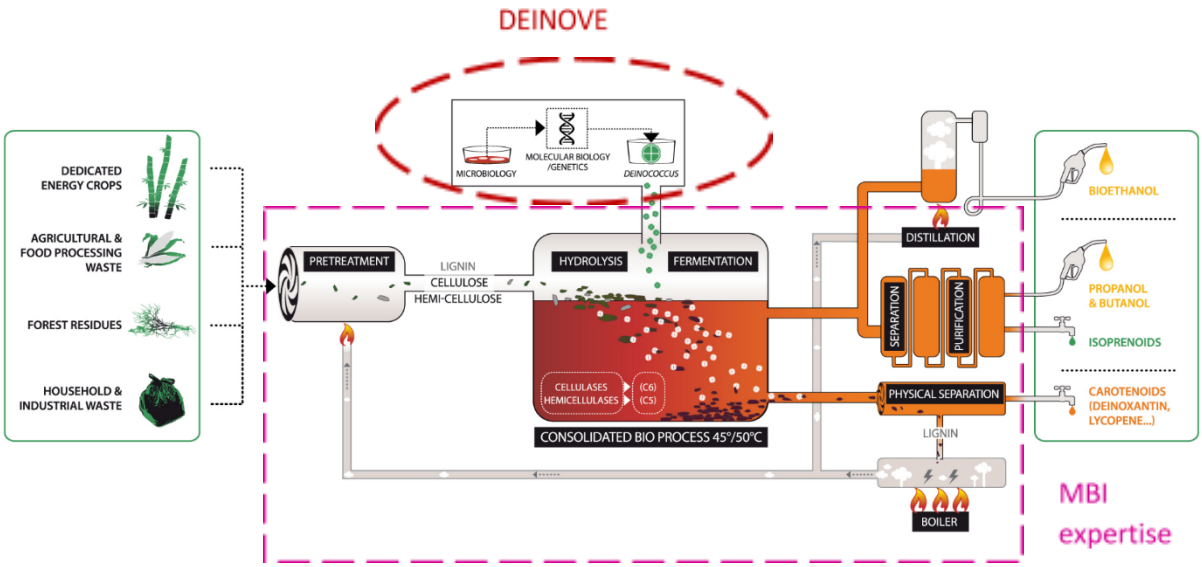
AFEX PRETREATMENT TECHNOLOGY

AFEX is an ammonia-based pretreatment technology for cellulosic biomass. This technology was initially developed by Professor Bruce Dale of Michigan State University after more than 20 years of research on biomass conversion and industrialization. In 2011, MBI received a $4.3 million grant from the US Department of Energy to take AFEX technology from the laboratory prototype stage (10 liters) to the pilot scale (1,000 liters and more).

Pretreatment processes all seek to dissociate the various components of biomass (cellulose, hemicellulose, and lignin) to hydrolyze complex sugars into simple sugars that are then fermented into molecules of industrial interest. In practical terms, pretreatment enables enzymes or microorganisms to digest biomass. Various thermal, chemical, or mechanical, pretreatment processes exist.

The AFEX process (a basic alkaline process) is certainly one of the most effective pretreatment methods both for reducing the production of inhibitors during the process and for increasing the accessibility of cellulose and hemicellulose.

DEINOL TECHNOLOGY



DEINOL is a production system aimed at converting pretreated industrial biomass into ethanol. The DEINOL solution's major industrial interest lies in the ability of *Deinococcus* bacteria to break down the complex sugars contained in lignocellulosic biomass and then to convert them into ethanol, all in a single operation, replacing the microorganisms that are traditionally used and a large part of the enzyme treatment that precedes fermentation.

The DEINOL process provides major competitive advantages, observed by MBI in Deinove's laboratory, that will enable industries to produce 2G biofuels under better financial conditions than currently available technologies:

- *Deinococcus* bacteria are the only microorganisms that are able to co-assimilate all C6 and C5 sugars[1] found in industrial biomass (glucose, xylose, also arabinose, etc.) and can even do so without diauxie[2], significantly improving yield and reducing fermentation time. They are also able to assimilate oligomers, i.e. partially hydrolyzed sugar chains, a significant benefit in terms of time and cost.
- *Deinococcus* bacteria are resistant to a large number of inhibitors produced during pretreatment, thus optimizing production conditions.

[1] Biomass contains three main components: lignin, cellulose and hemicellulose. The sugar content is provided by the last two components. Cellulose is an assembly of so-called "C6" sugars, because they contain 6 carbon atoms, such as glucose. Hemicellulose is an assembly of so-called "C5" sugars because they contain 5 carbon atoms, such as xylose and arabinose. To obtain viable yield, the microorganism used to convert these sugars into molecules of interest must be able to use both kinds of sugars.

[2] The yeasts currently used by industry first assimilate the C6 sugars (glucose) before they more or less effectively assimilate the C5 sugars (xylose, arabinose, etc.): fermentation time is significantly longer than with *Deinococcus*, with lower yields.

- Thanks to the thermophilic qualities of *Deinococcus* bacteria and their ability to hydrolyze (partially) and ferment biomass into ethanol at the same time, the DEINOL process can reduce equipment investments and production costs, while at the same time reducing the risk of contamination.

The test campaign carried out with MBI makes it possible to work with biomass that is qualified for industrial use and accelerate the industrialization by envisaging scaling up to volumes of up to 3,500 liters.

For DEINOVE, the first results obtained on the MBI substrates are an important step forward on the road to commercial production.

For further information on the test campaign being conducted as part of the DEINOL project: http://www.deinove.com/sites/default/files/pdf_news/deinol_testing_campaign_141015.pdf

About MBI

MBI, a mission-inspired, market-driven biotech derisking hub, is a premier multidisciplinary center sought out by industry partners for its unique capabilities. MBI collaborates with universities, research institutions, and corporations to accelerate the commercialization of biobased technologies for the production of sustainable fuels, chemicals, food, and feed. It is known for pioneering derisking, a process that quickly and cost-effectively identifies flawed technologies while accelerating viable ones through a stage-gated innovation process. Previous collaborations have included DuPont, Genomatica, and Novozymes. One of MBI's earliest noteworthy successes, in partnership with Michigan State University and Cargill, was the development of the first biodegradable polymer in global use, PLA.
More information at www.mbi.org

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About DEINOVE

DEINOVE (Alternext Paris: ALDEI) is ushering in a new era of green chemistry by designing and developing new standards of production based on bacteria of untapped potential: the Deinococci. Taking advantage of the bacteria's unique genetic properties and unusual robustness, DEINOVE optimizes natural fermentation and metabolic capabilities of these bacterial "micro-factories" to produce high value-added products from non-food biomass. The Company's primary markets are 2nd-generation biofuels (DEINOL) and bio-based chemicals (DEINOCHEM). On these markets, the Company offers its technology to industrial partners globally.
Listed on NYSE Alternext since April 2010, DEINOVE was founded by Dr. Philippe Pouletty, General Partner of TRUFFLE CAPITAL, and Pr. Miroslav Radman, of the Faculty of Medicine of Paris Descartes University. The company employs over 40 people in its new offices and laboratories located in Montpellier, France.
More information at www.deinove.com

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