

Press Release

DEINOVE UNVEILS BIO-BASED MUCONIC ACID PRODUCTION PROGRAM

- **Promising proof of concept has been completed for the effective production of muconic acid by *Deinococcus* from a variety of renewable sugar sources.**
- **The market size and their growth outlook, combined with an unmet demand for bio-based solutions, have led Deinove to structure and initiate a specific R&D program focused on this versatile molecule with a large number of applications, notably in plastics, textile fibers and food.**
- **Deinove's solutions benefit from the unusual and favorable characteristics of *Deinococcus*, which will enable the technology and favor economics. By leveraging the pioneering work of the Deinol program, Deinove expects to provide an innovative, competitive solution to the industry.**

Montpellier, 21 July 2015 – DEINOVE (Alternext Paris: ALDEI), a biotech company developing innovative processes for producing biofuels and bio-based chemicals by using *Deinococcus* bacteria, announced today that it has completed conclusive proof of concept for the production of muconic acid by a *Deinococcus* bacterium and has decided to launch a new R&D platform in this field.

Using their proprietary metabolic engineering tools, DEINOVE R&D has successfully designed a *Deinococcus* bacterium capable of producing renewable muconic acid, a particularly sought-after chemical intermediate, from a variety of feedstocks.

This project's development, alongside the Deinol and Deinochem programs, is based on thorough analyses of the technical and economic opportunities and competitive landscape:

At the technical level, the physiology of *Deinococcus* is well-suited for the production of this molecule, providing a critical competitive advantage compared with other alternatives. Indeed, the aerobic muconic acid production is close to the normal physiology of these bacteria and their metabolic flow is more favorable to this fermentation than other reference microorganisms.

At the commercial level, muconic acid is a versatile chemical intermediate whose derivatives – caprolactam, terephthalic acid (a precursor to PET) and adipic acid — are widely used in the plastics industry (notably for automotive and packaging applications), the production of synthetic fibers for textiles or industry (mainly nylon) and food (acidifying agent). The combined annual market value of these products is estimated to be worth several tens of billions of dollars.

Currently, these molecules rely on non-sustainable, price-fluctuating benzene and cyclohexane. There is a strong demand for the production of identical bio-based alternatives such as in green bottling, the nylon industry and food applications.

The existence of a significant market, a real demand and a favorable production economic equation have led Deinove to develop a program for bio-based muconic acid production.

“There is no doubt that a bio-based solution needs to be developed to complement the conventional chemical process used to produce these muconic acid derivatives. The feedback we got from our industrial and financial contacts was clear and confirmatory that this is a biochemistry with tremendous

potential, but looking for a solution. This is one of the few chemistries where the biological route appears superior to the oil-based catalytic conversions, as long as the fermentation solution provides key performance points. DEINOVE can bring a game-changing solution to the industry, by leveraging the benefits of a high-temperature Deinococcus-based oligomeric fermentation,” said Nagib Ward, Executive VP, Business Development at DEINOVE.

According to Rodney Rothstein, Professor of Genetics and Development at Columbia University Medical Center in New York and member of the DEINOVE Board of Directors, *“The main challenges facing the bioproduction of muconic acid at effective conversion rates have been known for about ten years. The extent of the genetic modifications needed to achieve this bioconversion has slowed progress toward production on an industrial scale. By using Deinococcus, which naturally produces very high levels of the key intermediate in the pathway, a significant part of the metabolic engineering will not be required. Combined with high aerobic kinetics, this achievement in Deinococcus represents considerable progress compared with existing technologies based on other microorganisms.”*

Proof of concept has been reached and will be followed by engineering phases aimed at increasing the strain’s performance under conditions closer to industrialization. Spread over a few years, and benefiting from the pioneering foundation work of the DEINOL platform, DEINOVE expects to develop this program at a competitive pace. In parallel, the company has engaged in discussions with several interested industrial contacts that would bring significant and synergistic upsides to this new DEINOVE program.

Emmanuel Petiot, CEO of DEINOVE, added, *“The main purpose behind the creation of Deinove was to bring about a revolution in the field of industrial fermentation. It is by finding innovative answers to major technological problems that DEINOVE fulfills its mission – muconic acid is one of the keys to the transition toward an oil-free economy; industrial production of bio-based muconic acid is a real innovative breakthrough and our assets in this field are undeniable.”*

The launch of this high-potential commercial platform will be announced tomorrow during the World Congress on Industrial Biotechnology organized by the American association BIO in Montréal.

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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