Clean Technology

‘Green’ Tylenol: Synthesizing Acetaminophen from Renewable Biomass

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an inexpensive method to synthesize the active ingredient in Tylenol and other pain relievers, as well as the commodity chemical *p*-aminophenol, from lignin.

The current process for producing acetaminophen uses chemicals from coal tar. The new method could be integrated into the biorefining process to improve the overall economics of alternative energy production.

Overview

Paracetamol (acetaminophen) is an analgesic and fever-reducing medicine. It is an active ingredient in many widely sold over-the-counter medicines such as Tylenol and Panadol. As a prescription pharmaceutical it is also sold in combination with opioid pain medications for treating more severe pain.

Introduced in the early 1900s, acetaminophen is a coal tar derivative. Today it is the most commonly used medication for pain and fever in the U.S. and on the World Health Organization’s List of Essential Medicines.

The Invention

UW–Madison researchers have developed a two-step process to synthesize paracetamol (acetaminophen) from *p*-hydroxybenzamide, from a compound easily isolated from lignin sourced from a number of biomass species including poplar, aspen, willow and palm. *P*-hydroxybenzamide is produced when such biomass is treated with ammonia in the ammonia fiber expansion process (AFEX) or the extractive ammonia process (EA), or may be easily obtained from the free acid, *p*-hydroxybenzoic acid, from saponification.

Compared to the current industrial process, which requires the nitration and reduction of a petrochemical derivative, phenol (itself requiring a three-step process from benzene), the new method utilizes a low-cost Hofmann-type reaction to achieve this conversion. The method will work using *p*-hydroxybenzamide obtained from any source but biomass is preferred.

Applications

- Production of high-demand pharmaceutical from renewable feedstock
- Could add value to biomass processing

Key Benefits

- Sustainable, cost effective and ready to scale

Stage of Development

The researchers have run the synthesis successfully.

Additional Information

For More Information About the Inventors

- John Ralph

Publications

- Read a UW news story about this technology.

Tech Fields

- Clean Technology : Biobased & renewable chemicals & fuels

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854