

BIOCHEM show case

Develop a route to paclitaxel that is sustainable

Problem

Taxol is an important anti-cancer drug. The active ingredient is paclitaxel, originally extracted from the bark of the Pacific yew *Taxus brevifolia*. Unfortunately, paclitaxel is present in small concentrations and the supply would not be sustainable. A new route was urgently needed. Direct chemical synthesis involved about 40 steps and an overall yield of 2% and were not considered commercially viable.

Technical solution

Bristol-Myers Squibb developed a route based on plant cell fermentation. Calluses of a specific cell line from yew are grown in an aqueous media using nutrients from renewable sources. The paclitaxel is directly harvested from the cells and then purified by chromatography and crystallization.

Benefits

- **Preservation of biodiversity**
- **Reduction in solvent use**
- **Reduction in chemical use**
- **Less waste**
- **Lower cost**
- **Year round production**
- **Compared to the best semi-synthetic route (starting with a closely related compound that can be sustainably obtained from European Yew), the plant cell**

Partnerships for better
innovation support



Eco-Innovation
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culture process eliminates production of 6 intermediates, 10 solvents and 6 drying steps. In its first 5 years it will avoid production of 32 tonnes of difficult waste.

Additional information

EPA 2004 Greener Synthetic Pathways Award

Website

<http://www.epa.gov/greenchemistry/pubs/pgcc/winners/gspa04.html>