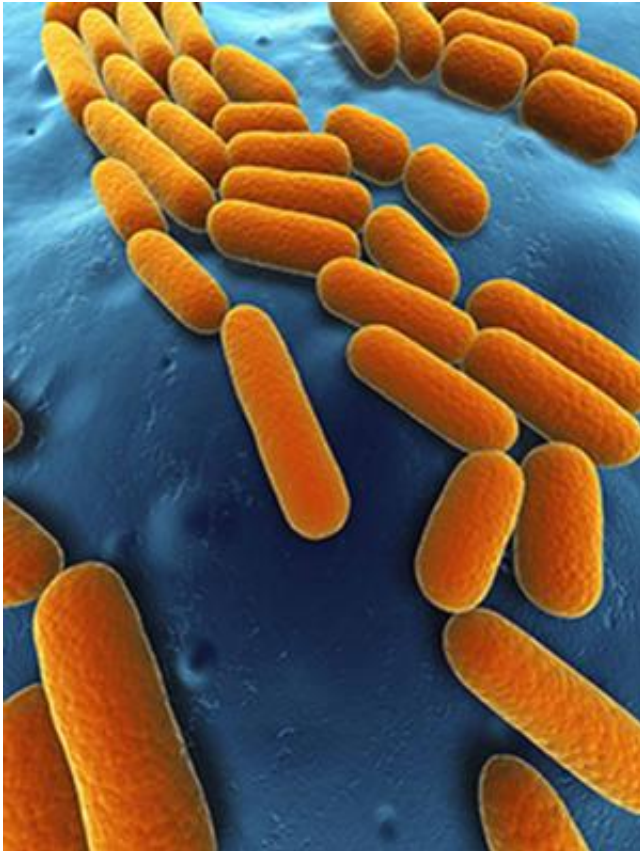


Green isoprene closer to reality

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A new transcriptomics-based model that accurately predicts how much isoprene the bacterium *Bacillus subtilis* will produce represents a step toward using bacteria as a clean, renewable fuel source.

(Phys.org) —With an eye toward maximizing isoprene production in bacteria, scientists at Pacific Northwest National Laboratory and Washington State University sought to understand isoprene regulation in

Bacillus subtilis, a bacterium typically found in soil that naturally produces more isoprene than other microbes. Potentially, industrial quantities of isoprene, a volatile liquid currently derived from oil used for aviation fuel and industrial applications, could be derived from bacteria. Like plant and animal cells, bacteria produce isoprene in small amounts to serve important signaling and structural roles. The researchers' result was a new, transcriptomics-based model that accurately predicts how much isoprene *B. subtilis* will produce when stressed or nourished.

This model marks a step toward understanding how environmental changes affect gene expression and, in turn, [isoprene](#) production by the bacterium. This fundamental insight into isoprene regulation in bacteria is advancing synthetic biology approaches to engineer microbes that produce isoprene, as well as other high-value metabolites.

The team treated *B. subtilis* with 30 different chemical stressors and nutrients that alter isoprene production then analyzed the expression of more than 4100 [genes](#). Transcriptomics data showed that of the 4100 genes, 213 genes influenced, or regulated, isoprene production.

With these 213 genes, the team built a statistical model that accurately predicts isoprene production levels in *B. subtilis* under different conditions, indicating that transcriptomics measurements alone can provide the necessary information to understand what cellular states are conducive to making isoprene.

Researchers will use this knowledge to identify the pathways that contribute to higher or lower levels of isoprene and potentially manipulate these pathways to produce high isoprene producing strains of [bacteria](#).

More information: Hess BM, J Xue, LM Markillie, RC Taylor, HS

Wiley, BK Ahring, and B Linggi. 2013. "Coregulation of Terpenoid Pathway Genes and Prediction of Isoprene Production in *Bacillus subtilis* Using Transcriptomics." *PLoS ONE* 8(6):e66104. [DOI: 10.1371/journal.pone.0066104](https://doi.org/10.1371/journal.pone.0066104)

Provided by Pacific Northwest National Laboratory

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