

# Fermentation of cocoa beans requires precise collaboration among two bacteria, and yeast

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Good chocolate is among the world's most beloved foods, which is why scientists are seeking to improve the product, and enhance the world's pleasure. A team of researchers from Germany and Switzerland—the heartland of fine chocolate—have embarked upon a quest to better understand natural cocoa fermentation and have published findings ahead of print in the journal *Applied and Environmental Microbiology*.

"Our studies have unraveled the metabolism of the rather unexplored acetic acid bacteria in the complex [fermentation](#) environment," says corresponding author Christoph Wittmann of Saarland University, Saarbruecken, Germany

In the study, Wittmann and his collaborators from the Nestle Research Centre, Lausanne, Switzerland, simulated cocoa pulp fermentation in the laboratory. They mapped metabolic pathway fluxes of the acetic acid bacteria, feeding them specific isotopes that could easily be tracked. Wittmann compares the process to viewing the flows of city traffic from the sky. "We could see what they eat and how they use the nutrients to fuel the different parts of their metabolism in order to grow and produce extracellular products," he says.

The key molecule to initiate flavor development is acetate, says Wittmann, noting that "The intensity of the aroma from a fermented bean is amazing."

Production of acetate requires two major nutrients: lactate and ethanol.

These are produced by [lactic acid bacteria](#), and yeast, respectively, during the initial fermentation of cocoa pulp sugars, says Wittmann.

The [acetic acid](#) bacteria then process these simultaneously, via separate metabolic pathways, ultimately producing acetate from them.

"This discovery reveals a fine-tuned collaboration of a multi-species consortium during [cocoa](#) fermentation," says Wittman. And that may help improve selection of natural strains for better-balanced starter cultures.

**More information:** The manuscript can be found online at [aem.asm.org/content/early/2014 ... 048-14.full.pdf+html](http://aem.asm.org/content/early/2014/06/10/048-14.full.pdf+html) . The final version of the article is scheduled for the August 2014 issue of *Applied and Environmental Microbiology*.

Provided by American Society for Microbiology

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