

## Fungi, the Rodney Dangerfield of Biofuels



By JIM LANE, Editor & Publisher, *Biofuels Digest*

Bacteria, algae, yeast — there's so much development around these platforms that sometimes we wonder if that's how San Francisco and environs became known as the BAY area.

BAY projects — in so many ways, dominate the BAY Area. Amyris with its exotic yeasts; Solazyme with its superfine heterotrophic algae, LS9 with its magic modified *E. coli* bacteria. All of them making an array of products — chemicals, diesel, jet fuel, flavorings, lubricants, food ingredients, surfactant alcohols, skin-care products, and biodiesel among them.

Now, yeast is a fungi, but fungi as a Kingdom is a lot broader than our friend yeast and, like Rodney Dangerfield, it been getting, by and large, no respect, no respect. Researchers have for years been using them as a kind of biological grenade — the destructive, “rot all things speedily” properties of fungi. But now they are embracing the light — fungi's abilities to create.

“He's a guy struggling with two sides of himself — the dark and the light — and everything he does in his life is filtered through issues of control.” The actor Mark Ruffalo was, in fact, talking about *The Incredible Hulk's* place in the Marvel Cinematic Universe — but he might as well have been talking about fungi.

Fungi — being kinda weird, kinda ugly, and associated, broadly with rot, have garnered a bad rep over the years. The Japanese science-horror flick *Matango*, *Fungus of Terror* (also known as *Attack of the Mushroom People*) didn't help much. If the average person thinks at all about the science of mildews and molds, it is probably in the remarkable ability of Lysol spray in getting rid of them.

Rather than the potentialities that lay in tapping the abilities if molds, mildews,

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mushrooms and an array of organisms in the Pacific Northwest's temperate rainforests that look like the blown-glass creations of Dale Chihuly.

### **Fungi's incredible powers**

Like comedy's Rodney Dangerfield, fungi usually get "no respect, no respect"

The traditional displays of fungal power are well-known enough — the role of yeast is fermenting grains into alcohols, for one. More recently, the demonstrated power of fungi to spew out cost-effective cellulase enzymes. In that realm, there appears to be an ongoing debate about whether *Trichoderma* (used by, say, Novozymes and DuPont) is a more effective media than Dyadic's *Myceliophthora thermophila* — but in making enzymes, fungi is the king of the world.

But now, fungi's abilities to make a whole lot more are under development. Fuels, chemicals, and more. Could the world be dragged out of its carbon dilemma with an assist from er, mildew? Could be.

### **Tapping into fungi's abilities**

It was thereby a happy if not completely unexpected development that in its latest \$10 million funding of applied R&D in developing "Advanced Biofuels and Bio-based Products," the DOE tapped a team — from Pacific Northwest National Laboratory, University of Southern California, University of Kansas, SUNY-Buffalo, Denmark Technical University and Novozymes — to use fungi to convert cellulosic sugars into chemicals and fuel precursors. It's a multi-year, \$2.5 million project that will be led by Ken Bruno at PNNL.

These compounds can be further altered to make plant-based gasoline, diesel, other liquid transportation fuels and chemicals that have traditionally been made from petroleum.

The PNNL-led research team will examine the pathways that fungi use to make organic molecules such as citric acid. Researchers will develop a metabolic model that maps the many steps fungi use so we can make other molecules. According to the research plan, the model will help increase the volume of fuel precursors produced by the project's method.

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### **The bottom line**

It's time to move beyond Matango, Fungus of Terror to a more nuanced view of this remarkable kingdom of organisms. As humans, we are fascinated far more by super fauna - whales, dinosaurs, elephants — than the other, microbial end of the organic chain. But we may well find that, in a future where energy, food, water and everything else is made scarce by a rising tide of human consumption and population — that our very best friends are waving at us from the other end of the microscope, showing off their stuff on the slide and in the Petri Dish like supermodels gliding down the runway.

*What's your take? Please feel free to comment below! For more information, please visit [www.biofuelsdigest.com](http://www.biofuelsdigest.com) [1].*

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