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Phaff Collection News

Yeasts of yesterday and today, for research of tomorrow

A big year!

The year 2012 was full of activity at the Phaff Yeast Culture Collection, including several research projects, and useful additions to the collection catalog through internal research and deposits from external collections and researchers.

The Phaff collection is also participating in national and international efforts to improve the standing of microbial culture collections.

The Phaff Yeast Culture Collection is the fourth largest collection of its kind, with over 7,000 strains in the public catalog.

2012 at the Phaff Yeast Culture Collection

The Phaff Yeast Culture Collection is in good company — there are a number of excellent yeast culture collections around the world. To help publicize these collections to potential users in the biotechnology field, Boundy-Mills sent a survey to selected yeast collection curators to gather information about uses of their culture collections. This information was combined with data gleaned from the World Data Centre for Microorganisms website, and published in the Journal for Industrial Microbiology and Biotechnology (Boundy-Mills, JIMB 39 (5) 673-680).

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Yeast lipids

We are working to develop new yeast oils for fuels, chemicals, and food ingredients. The long-term goals are to identify specific high-oil yeast strains that grow well on specific feedstocks such as agricultural and food processing waste. We recently published an improved screening protocol using Nile Red staining, to identify lipid-accumulating yeasts (Sitepu et al., Journal of Microbiological Methods, 91 (2) 321-328).

Continuing work on yeast lipids

Next up: a survey of dozens of potential lipid-accumulating yeasts.

Pectinolytic yeast causes olive softening

In a project led by Maria Marco (Food Science and Technology, UC Davis), we examined microbes associated with spoiled and unspoiled Sicilian-style olives, in an attempt to identify the agent causing softening of the mesocarp. We isolated and identified a number of pectinolytic yeasts, including a particularly active strain of *Saccharomyces cerevisiae*. When this yeast was inoculated into pilot-scale fermentations, the olives became soft, indicating that we may have identified the spoilage culprit. This was published in 2012 (Golomb et al., Food Microbiology 33(1) 97-106). We are now working on olive fermentation inoculation conditions to help prevent this type of spoilage.

QUESTION: Could the pectinolytic strains of *S. cerevisiae*, *Pichia manshurica*, and *Candida boidinii* that we isolated be useful for conversion of food processing or other plant waste to biofuels?
New work on *Drosophila*-yeast associations

**Drosophila melanogaster**: In a long series of studies in collaboration with Judy Stamps (Evolution and Ecology, UC Davis), we examined the effects of *Drosophila melanogaster* flies on yeast abundance and diversity in banana exposed to adults or larvae. We found evidence of niche construction: presence of flies resulted in more predictable numbers of yeasts, and a narrower range of species. Larvae excrete viable yeasts in their fecal pools, yeast species that they find palatable, and discourage growth of filamentous fungi. We published these observations of proto-agriculture in PLoS ONE (Stamps et al. 2012, PLoS ONE 7(7) 1-10).

**Drosophila suzukii**: In a project led by Frank Zalom (Department of Entomology, UC Davis) and his PhD student Kelly Hamby and visiting professor Alejandro Hernandez (Universidad de Extremadura, Badajoz, Spain), we studied yeasts associated with the agricultural pest *Drosophila suzukii*. This fruit fly recently invaded California, and infests many soft fruits such as cherries and raspberries. We are working with the Zalom lab to develop an improved yeast-based lure for this fly. We used culture-based and molecular methods to profile yeasts in infested cherries and raspberries, and adult flies and larvae, and found a variety of yeast species. Surprisingly, just about every adult fly, larva and infested fruit sampled contained *Hanseniaspora uvarum*. This was published in Applied and Environmental Microbiology (Hamby et al., AEM 78(14) 4869-4873). A very artistic rendering by Hamby of *D. suzukii* using yeasts on an agar plate was the AEM July 2012 cover art!

**Drosophila** as a “model organism”

*Drawing produced by Kelly Hamby (PhD Student, Entomology, UC Davis)*

**INGREDIENTS:**
- 1 Petri plate
- Agar medium
- 2 active cultures of yeasts isolated from *Drosophila suzukii*
- 1 “model organism” willing to pose for a portrait
- Patience

To highlight our work on yeasts associated with the agricultural pest *Drosophila suzukii* (Spotted Wing Drosophila, SWD), graduate student Kelly Hamby produced a drawing of SWD, using yeasts we isolated from SWD. Applied and Environmental Microbiology used the photo for the cover of their July 2012 issue.
Comparing Notes

Networking with collection curators

Public microbe collections are an important element of biological research infrastructure. While the collection of viable, pure, properly identified microbes are an essential element of a microbe collection, much more is required: knowledge of taxonomy, database management, customer service, quality control, intellectual property issues, and adherence to national and international regulations such as IATA and the Convention on Biodiversity. Networking with other collection curators makes these jobs easier. Over the years, the Phaff collection has improved collection management and customer service thanks to advice from other collection curators.

National networking

Kyria Boundy-Mills, curator of the Phaff Yeast Culture Collection, is on the steering committee of the US Culture Collection Network (USCCN). This five-year, NSF-funded project is led by Kevin McCluskey, curator of the Fungal Genetic Stock Center at the University of Missouri, Kansas City. The goals of the USCCN are to implement a National Microbial Germplasm system, and to foster communication between US collections, foreign collections, and international collection networks. In September 2012, Boundy-Mills attended the kick-off event of the USCCN, a gathering of curators of numerous US culture collections and other stakeholders and policy makers, held in Kansas City, MO in September. Discussions included pricing structures, databasing, quality control, financial support of collections, IP issues and customer service, which are resulting in improved service to Phaff collection users.

International networking

Boundy-Mills was also one of three representatives of the USCCN that attended the first meeting of an EU-funded effort being conducted in Europe called Microbial Resource Research Infrastructure (MIRRI), held in Braunschweig, Germany in December 2012. Implementation of the Convention on Biodiversity and Nagoya Protocol were hot issues. One of the high points of this trip was a tour of the DSMZ collection, an exemplary government-funded microbe collection in Germany.
Hundreds of yeast species, hundreds of potential uses!

In 2012, Phaff collection yeasts were distributed to academic, government agency and industrial researchers around the world for a broad variety of uses such as:

- Conversion of biomass to biofuels
- Control of agricultural pests
- Phylogenomics
- Taxonomy
- Validation of clinical diagnostic kits
- Development of a reference database for Illumina sequence data analysis
- And much more….

Does the Phaff collection have what you need for your research? The Phaff collection contains 7,000 yeasts belonging to over 750 different species, with anywhere from a single strain to over 500 strains per species. While other yeast collections emphasize lab strains, wine strains, or medical strains, the Phaff collection’s main focus is yeasts isolated from environmental habitats. Many yeasts were isolated from **decaying plant matter** and the insects that inhabit them, making them particularly useful for research on conversion of biomass to value-added products.

Examples of habitats of origin include:

- **FOODS AND BEVERAGES:** wine, baking, brewing, spoiled beer, lambic beer, sausage, sauerkraut, olives, traditional fermentations, coffee beans, dairy products, fish, soft drinks, honey, meats
- **FRUITS AND VEGETABLES:** including apple, banana, cherry, raspberry, soybean, many fruit juices
- **PLANTS:** flowers from allium to zinnia, shrubs, grasses, dozens of cactus species, dozens of tree species such as aspen, birch, chestnut, and the rest of the alphabet
- **INSECTS:** ants, beetles, bees, cockroach, *Drosophila*, lacewing, mites, wasps, and much more
- **OTHER ENVIRONMENTAL:** oceans, rivers, lakes, swamps, glaciers, atmosphere, sewage sludge, wood pulp, soil
- **CLINICAL ISOLATES:** cerebrospinal fluid, colostrum, dandruff, teeth, feces, hair, lung, sputum

New additions to the public catalog of the Phaff collection in 2012 include:

- Strains of *Cryptococcus*, *Candida* and other species isolated from oak, birch and maple, deposited by Joseph Heitman, Duke University
- Yeasts isolated from solitary bees and their feeding substrates by Ryder Diaz (Evolution and Ecology, UC Davis)
- Yeasts isolated from cockroach and stick insects by Matan Shelomi (Entomology, UC Davis)
- Yeasts and filamentous fungi isolated from walnut twig beetle (in collaboration with Steve Seybold, USDA Forest Service, Davis, CA)

A full strain catalog is available online at [www.phaffcollection.org](http://www.phaffcollection.org). You can search by genus, species, strain ID number, geographic location, source habitat, etc.
Yeast species available from the Phaff collection, and the number of strains of each, are listed below. In addition, there are dozens of undescribed species, awaiting names. Contact collection curator Kyria Boundy-Mills for more information, klbmills@ucdavis.edu.
Phaff Collection Quick Facts:

- Over 7,000 strains in the public catalog
- Over 750 different yeast species (roughly half of the known yeast species)
- Oldest yeast: isolated by the UC Berkeley cellarmaster in 1893
- Percent of strains not available from any other collection: 80%

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