

SMBE Satellite meeting on the Evolution of Fungal Pathogens

Québec City, Canada on May 25th and 26th

Final report submitted to the Society for Molecular Biology and Evolution

Isabelle Giguère et Christian Landry, on behalf of the organizing committee

Organizers

Christian Landry, professor, Université Laval

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Co-organizers

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Emilie Alexander, MSc student, Université Laval

Erika Dort, PhD student, University of British Columbia

Susannah Selber-Hnatiw, PhD student, Concordia University

The SMBE Satellite meeting on the Evolution of Fungal Pathogens ([website](#)) was held in Québec City, Canada on May 25th and 26th. There were 57 participants on site and 117 attendees online. We had a full agenda with a total of 36 presentations including 5 presentations from keynote speakers (Dr. Christina Cuomo, Dr. Charissa De Bekker, Dr. Richard Hamelin, Dr. Bin He and Dr. Lori Huberman).

The short term goal was to create a dialogue among scientists who are approaching the increasing problems caused by fungal pathogens from different angles and perspectives. In particular, the meeting included individuals who study fungal pathogens of humans, animals, and plants. Surprisingly, although fundamentally the same processes underlie evolution of pathogens in these different contexts, there are few opportunities for scientists from these silos to gather together. Even within universities, researchers who study fungal evolution can be separated into different departments such as Biology, Zoology, Plant Science, Microbiology, Forestry, Plant Science, Molecular Biology, etc. Similarly, there is no single meeting on "fungal evolution"; microbiologists are often underrepresented at 'evolution' meetings and both fungal researchers and evolutionary biologists are often underrepresented at 'microbiology' meetings. This meeting therefore created an exceptional opportunity for early career researchers to connect with their peers and also to exchange with each other in a meeting of a limited size, which favors networking. In the long term, we hope this meeting will have catalyzed and improved cross-talk among fungal researcher silos, leading to better knowledge sharing among researchers who have embraced evolutionary approaches in future research plans and in practices to control and limit fungal infections.

The meeting was organized by a group of four professors, one postdoctoral Fellow, one research assistant, three PhD students, two MSc students and a coordinator. The attendance was very diverse and representative of the field. We had people at different career stages; Academia staff scientists (5), Faculty/Group leader (35), Government (25), Graduate Students (63), Industry (1), Postdoctoral Fellows (26), Undergraduate students (8), Other (4). There were people who identified themselves as male (69) and females (88) and Gender non-conforming (1). Various groups were represented (self identification upon registration), Black or African Americans (18), Hispanic (17), Indigenous Canadian (1), Asians (38) and Whites (72) from 9 countries (Algeria, Canada, France, Poland, Portugal, Slovenia, Spain, the Netherlands, UK and USA). The event was inclusive as we have selected a certified accessible site (fully wheelchair accessible), offered meals to comply with allergies or to dietary preferences and we have given the opportunity to the attendees to add the pronoun of their choice on their name tag. Equity was also considered in our event as evaluation of the abstracts for oral presentation was based on science only and not based on career stage, ethnicity or gender. Everyone who wanted to present was given the opportunity to present an oral talk. The duration was adjusted according to the content of the abstract submitted, time constraints and the preference of the speakers.

We feel that the meeting had important outcomes especially for students to network amongst themselves and with professors and researchers, especially given the small nature of the meeting. We feel it created a sense of community among researchers from normally isolated disciplines. New collaborations were also established between evolutionary biologists and mycologists.

Website



Invited Speakers



Christina Cuomo
Broad Institute

[website](#)

Population genomics and the evolution of virulence traits in *Cryptococcus neoformans*



Bin He
Iowa University

[website](#)

Parallel expansion and divergence of the Hyr/Iff-like (Hil) adhesin family in opportunistic yeast pathogens



Charissa de Bekker
University of Central Florida

[website](#)

Hijacking behavior: Connecting fungal genomes with animal host phenomes using zombie ants as a model



Richard Hamelin
University of British Columbia

[website](#)

Evolution of fungal forest pathogens



Lori Huberman
Cornell University

[website](#)

Investigating fungicide mode of action using massively parallel screens

Agenda of the meeting

Wednesday May 25th

8:00-9:00 Registration

9:00-11:30 Quebec City Walking Tour (for those who registered for the tour)

11:30-12:00 Registration

12:00-1:00 Lunch

Session 1, 1:00-5:00 - Rebecca Shapiro Chair

- 1:00-1:10 Christian Landry - Welcome remarks
- 1:10-1:50 Christina Cuomo (Broad Institute, USA)- Population genomics and the evolution of virulence traits in *Cryptococcus neoformans* (Invited speaker)
- 1:50-2:05 Geneviève Arsenault-Labrecque (Université Laval, Canada) - Assessment of genetic diversity of *Phytophthora sojae* avirulence genes for field-specific management of Phytophthora root rot in soybean
- 2:05-2:20 *Interactive activity I*
- 2:20-2:35 Bogumil Karas (Western University, Canada) - Designer conjugative plasmids enable engineering of diverse microbes
- 2:35-2:40 Michelle Agyare-Tabbi (University of Guelph, Canada): A comprehensive analysis of the role of the DNA damage response in *Candida albicans*
- 2:40-2:45 Emilie Alexander (Université Laval, Canada) - Deep mutational scanning to study antifungal resistance across different fungal pathogens

2:45-3:00 Break

- 3:00-3:15 Jennifer Geddes-McAllister (University of Guelph, Canada) - One health to overcome fungal diseases and anti-fungal resistance
- 3:15-3:30 Anna Fijarczyk (Université Laval, Canada) - Genome size and complexity of fungal pathogens depend on their lifestyle
- 3:30-3:45 Emily Xiong (University of Toronto, Canada) - Identifying and characterizing genes important for *Candida albicans* fitness in diverse environmental conditions

3:45-3:55 Interactive activity II

- 3:55-4:10 Brianna Ball (University of Guelph, Canada) - Uncovering novel anti-virulence strategies to combat fungal infections
- 4:10-4:15 Meea Fogal (University of Guelph, Canada) - Creating a *Candida albicans* genome-wide CRISPR interference library for large-scale genetic analysis
- 4:15-4:20 Abdul-Rahman Adamu Bukari (University of Manitoba, Canada) - *Candida albicans* clinical isolates from Manitoba reveals extensive phylogenetic diversity with limited regional clustering in a global context
- 4:20-5:00 Bin He (Iowa University, USA) - Parallel expansion and divergence of the Hyr/Iff-like (Hil) adhesin family in opportunistic yeast pathogens (Invited speaker)

6:30-8:30 Group dinner (in hotel)

Thursday May 26th

Session 2, 9:00-12:00 - Adnane Sellam Chair

- 9:00-9:05 Introduction to Day 2
- 9:05-9:45 Charissa De Bekker (University of Central Florida, USA) - Hijacking behavior: Connecting fungal genomes with animal host phenomes using zombie ants as a model

9:45-10:00 Romain Durand (Université Laval, Canada) - Quantifying the path to resistance to one of the oldest antifungal drugs

10:00-10:10 *Interactive activity III*

10:10-10:25 Nana Aboagye Acheampong (University for Development Studies, Ghana) - Antimicrobial and antibiofilm formation activities of fungal metabolites

10:25-10:30 Anuradha Jayathissa (University of Manitoba, Canada) - Identification of *Fusarium graminearum* strains producing different hydrophobin structural variants, and evaluation of the expression of hydrophobin genes during malting

10:30-10:35 Nnaemeka Nnadi (Plateau State University, Nigeria) - Occurrence of unusual *Candida* with growth in extreme environmental stressors from hospital environment in Jos, Plateau State Nigeria

10:35-10:40 Nick Gervais (University of Guelph, Canada) - Investigating the role of chromosome R in drug tolerance in *Candida albicans* via CRISPRa pooled screening

10:40-11:00 Break

11:00-11:15 Philippe Despres (Université Laval, Canada) - Asymmetrical dose-responses shape the evolutionary trade-off between antifungal resistance and nutrient use

11:15-11:30 Erika Dort (University of British Columbia, Canada) - Comparative genomic analyses with machine learning reveal signatures associated with fungal phytopathogenic lifestyles and traits

11:30-11:45 Aleeza Gerstein (University of Manitoba, Canada) - Intrapopulation variation in vulvovaginal candidiasis

11:45-11:50 Camille Bédard (Université Laval, Canada) - Functional impact of amino acid substitutions in Erg11 on resistance to azole antifungals

11:50-11:55 Susannah Selber-Hnatiw (Concordia University, Canada) - Secondary metabolite production in *Aspergillus niger*: methyltransferase specificity

11:55-12:00 Edel Pérez López (Université Laval, Canada) - ClubGenoEvo: A global initiative to unveil the clubroot pathogen origins, diversity, and evolution

12:00-1:00 Lunch

Session 3, 1:00-5:00 - Isabelle Benoit-Gelber Chair

1:00-1:40 Richard Hamelin (University of British Columbia, Canada) - Evolution of fungal forest pathogens (Invited speaker)

1:40-1:55 Patrick Lajoie (Western University, Canada) - Divergent control of the transcriptional landscape by *Tra1* across yeast species

1:55-2:10 *Interactive activity IV*

2:10-2:25 Benjamin Cinget (Université Laval, Canada) - Mitochondrial intron distribution and strobilurin resistance

2:25-2:40 Richard Kwizera (Makerere University, Uganda) - Dilemma of diagnosing Chronic Pulmonary Aspergillosis in a TB endemic resource-limited setting: the Ugandan experience

2:40-2:45 Lauren Wensing (University of Guelph, Canada) - An inducible CRISPR interference system to study the role of essential gene function during drug tolerance in antifungal resistant isolates of *Candida albicans*.

2:45-3:00 Break

3:00-3:15 Jorge Luis Cuamatzi Flores (UNAM Campus Juriquilla, México) - Aneuploidy as a rapid mechanism of *Ustilago maydis* SG200 to adapt to oxidative stress

3:15-3:30 Affoussatou Tabe (University of Parakou, Benin) - New records and sequence data for rust fungi (Pucciniales, Basidiomycota) on useful plants in Benin

3:30-3:45 Manon Henry (Université de Montréal, Canada) - Manganese homeostasis shapes fungal fitness and virulence

3:45-3:50 *Interactive activity V*

- 3:50-4:05 Viola Halder (University of Guelph, Canada) - Genetic interaction analysis conducted in *Candida albicans* stress response genes through the use of CRISPR-Cas9-based gene drive array
- 4:05-4:10 Malisa Fernando (Western University, Canada) - Differential requirement for *Ire1* in azole resistance across yeast species.
- 4:10-4:15 Emily Puumala (University of Toronto, Canada) - Identification of a novel lipid biosynthesis inhibitor with activity against the emerging fungal pathogen *Candida auris*
- 4:15-4:20 *Group stretching*
- 4:20-5:00 Lori Huberman (Cornell University, USA) - Investigating fungicide mode of action using massively parallel screens (Invited speaker)

Annex 1: [List of participants](#)

Annex 2: Photos of the event







