UNIVERSITY OF ALBERTA MICROFUNGUS COLLECTION AND HERBARIUM (UAMH)

A Division of the Devonian Botanic Garden, Faculty of Agriculture, Forestry and Home Economics
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SUMMARY OF ACTIVITIES FOR 2006

Staff, Volunteers

Professor (Curator) - **L. Sigler**
.66 FTE Devonian Botanic Garden/UAMH, Fac. Agriculture, Forestry & Home Economics
.33 FTE Medical Microbiology & Immunology, Fac. of Medicine
Consultant in Mycology, PLNA/UAH Microbiology & Public Health
& Adj. Prof. Biol. Sci.
Assistant Curator (.5 FTE Non-academic, .5 FTE trust, NSERC) – **C. Gibas**
Technical or laboratory assistants (trust): - **A. Hashimoto, A. Bicomong** (part-time since Aug), **S. Tchir** (part-time until July), **V. Jajczay** (casual)
Volunteer- **M. Packer**

Affiliate
R. Currah, Professor, Biological Sciences, Faculty of Science

Academic Teaching & Graduate Supervision

L. Sigler

- MLSCI 240 Pathogenic Bacteriology (4 lectures)
- BIOL 306 Biology of the Fungi (2 lectures)
- MMI 427 Fungi in the Human Environment (full responsibility)

Graduate Supervisory Committees (Sigler)
M. Calvo-Polanco, Renewable Resources, Supervisor, J. Zwiazek,
M. Day, Biological Sciences, Supervisor, R. Currah
M. Davey, Biological Sciences, Supervisor, R. Currah

Professional Training (Workshop)

Feb 22 Invited instructor, one day workshop on "DNA or the Classical Way- Identifying Fungi in 2006" for US National Laboratory Training Network /Texas State Health Services, Atlanta, GA (with Dr. M. Brandt, Centers for Disease Control). Arlington, TX

Cultures Received, Distributed and Accessioned

Cultures received for identification, deposit or in exchange (**Table 1**) **191**

Cultures distributed on request or in exchange (**Table 2**).....**268**

Culture Collection and Herbarium Accessions

New accessions **161**

Total accessions.....**10765**

Information on Accessions available through print and on-line CATALOGUES

Catalogue of the University of Alberta Microfungus Collection and Herbarium. [PDF]
http://www.devonian.ualberta.ca/uamh/search

In-house and Collaborative Research

Refereed Journal Articles

1. Greif MD*, Gibas C Fe C, Currah RS. *Leptographium piriforme* sp. nov., from a taxonomically diverse collection of arthropods collected in an aspen-dominated forest in western Canada. Mycologia 2006; 98 771-780.
*Biol. Sci., U of Alberta

Abstract During a survey of fungi associated with arthropods collected in a southern boreal mixed-wood forest in Alberta we obtained 29 isolates of a unique species of *Leptographium*. This species displayed a distinct combination of characteristics, including curved conidia on short-stipitate conidiophores, a secondary micronematous conidial state, stalked pear-shaped cells and an optimal growth rate at 35 C, and is described as *Leptographium piriforme* sp. nov. The isolates were most similar morphologically to *L. crassivaginatum*, but ITS sequence comparisons indicate that our isolates cannot be assigned to this or any other sequenced species in the genus. Initial observations on the pear-shaped cells in feeding experiments with *Sancassania berlesei* show that these structures may act as a nutritional incentive for visiting arthropods. Most arthropods carrying this new species were caught in traps baited with dung which, in light of its optimum growth temperature, suggests a coprophilous phase in the life cycle of this species. Additional isolates from woody species typical of the survey area might clarify whether *Leptographium piriforme* in its forest habitat occurs as a plant pathogen or saprobe.

2. Paré JA*, Coyle KA, Sigler L, Maas AL III, Mitchell RL. 2006. Pathogenicity of the *Chrysosporium* anamorph of *Nannizziopsis vriesii* for veiled chameleons (*Chamaeleo calyptratus*). Medical Mycology 44:25-31.
*Toronto Zoo, 361A Old Finch Avenue, Scarborough, Ontario, Canada M1B 5K7

Abstract Veiled chameleons (Chamaeleo calyptratus) were experimentally challenged with the fungus Chrysosporium anamorph of Nannizziopsis vriesii (CANV). Chameleons were exposed to conidia in their captive environment, or were inoculated by direct application of a conidial suspension inoculum on intact and on abraded skin. The CANV induced lesions in all experimental groups and was recovered from infected animals, fulfilling Koch's postulates and confirming that it may act as a primary fungal pathogen in this species of reptile. A breach in cutaneous

integrity, as simulated by mild scarification, increased the risk of infection but was not required for the CANV to express pathogenicity. Initial hyphae proliferation occurred in the outer epidermal stratum corneum, with subsequent invasion of the deeper epidermal strata and dermis. A spectrum of lesions was observed ranging from liquefactive necrosis of the epidermis to granulomatous inflammation in the dermis. CANV dermatomycosis appears to be contagious and can readily spread within a reptile collection, either directly through contact with infective arthroconidia or indirectly via fomites. Dense tufts of arthroconidiating hyphae were demonstrated histologically on the skin surface of many animals that developed dermatomycosis, and these arthroconidia may act as infective propagules involved in the transfer of disease between reptiles.

Refereed Articles In Press

3. Bowman MR, Paré JA, Sigler L, Naeser JP, Sladky KK, Hanley CS, Helmer P, Phillips LA, Brower A, Porter R. Deep fungal dermatitis in three inland bearded dragons (*Pogona vitticeps*) caused by the *Chrysosporium* anamorph of *Nannizziopsis vriesii.* Med. Mycol. (in press)
4. Iwen PC, Sigler L, Freifeld AG. 2006. *Mucor circinelloides* identified by molecular methods as a cause of primary cutaneous zygomycosis. J Clin Microbiol (in press).
5. Kumar D, Sigler L, Mohan S, Gibas CFC, Medeiros BA, Peckham K, Schuh A. *Graphium basitruncatum* fungemia in a patient with acute leukemia. Jour Clin Microbiol (in press)

Book Chapter

6. Paré JA, Sigler L, Rosenthal RK, Mader DR. 2006. Microbiology : Fungal and bacterial diseases of reptiles. p 217-238. In: Reptile Medicine and Surgery, 2nd ed. (Ed DR Mader) Saunders Elesevier, St. Louis, MO.

Presentations

Oral presentations (Invited speaker)

7. Sigler, L. 2006. Developments in keratinophilic Onygenales. ECMM/ISHAM cosponsored Symposium 4 entitled Molecular taxonomy. ISHAM Paris, France, Jun 26.
8. Sigler, L. 2006. Dealing with barriers to the movement of fungus cultures - one step forward - two steps back. Symposium 32 entitled Regulation, quality control and education, ISHAM Paris, France, Jun 28.

Abstracts

9. Hambleton, S., Sigler, L. 2006. *Geomyces pannorum*, a cosmopolitan soil fungus: phylogenetic relationships and species concepts. International Mycological Congress, Cairns,Australia P-649. [oral presentation by Hambleton]
10. Gibas, C. & L. Sigler. 2006. Phylogenetic and morphological evaluation of *Onychocola*-like isolates obtained from nail, skin and other substrates. ISHAM P-0748, Jun 28. [Poster]

Identification, Advisory and Depository Services

Cultures are received from medical laboratories, individuals or other agencies for identification, verification or deposit. We provide advice on fungus biology or significance of mold growth, and assistance with problems of fungal contamination or deterioration. In 2006, these agencies referred isolates (see **Table 1**): Mycology Laboratory Services, Ontario Ministry of Health; Johns Hopkins School of Medicine, Baltimore, MD; Toronto Medical Laboratory & Mt. Sinai Hospital, Toronto, ON; National Institutes of Health, Rockville, MD; Microbiology Laboratory Centre, Sunnybrook & Women's College Health Science Centre, Toronto, ON; University of Texas Health Science Center, San Antonio, TX; Univerity Hospital of Cleveland, Case Western Reserve University, Cleveland, OH; Auckland Hospital, Auckland, NZ; Microbiological Diagnostic Unit, University of Melbourne, Melbourne, Australia; Toronto Zoo, Scarborough, ON; Veterinary Medical Center, University of Florida, Gainesville, FL; San Diego Zoo, San Diego.

We continue to provide consulting service to the National Reference Centre (NRC), Microbiology & Public Health, Univ. of Alberta Hospitals, Dr. R. Rennie, Director. Thirty six isolates were received for identification in 2006. Many of these isolates are referred to the NRC from provincial public health laboratories and hospital microbiology laboratories.

Environmental

Various public and private agencies and members of the public contact us concerning assessment, significance and control of molds in the indoor environment. In addition to providing advice by telephone, we examine bulk and tape samples for presence and types of molds, and provide advice on the potential health hazards of exposure. In 2006, about 19 reports were prepared on samples submitted from homes, commercial or public buildings in the western provinces.

Visits, Presentations, Workshops

Apr 30	LS spoke to the U of A Dr. Walter H. Johns Alumni Circle on "Fungal friends and foe."
Jun 26	LS spoke in symposia entitled "Molecular taxonomy" and "Regulation, quality control and education" at the International Congress of the International Society for Human and Animal Mycology, Paris, France.
Jul 24	Dr. T. Marrie, Dean, Faculty of Medicine, U of Alberta
Aug 22	Dr. P. Kroeger, Herbarium, Dept. of Botany, University of British Columbia & Dr. B. Kendrick, Mycologue, Sidney, B. C. visited following the NAMA conference at Hinton.
Sep 1	Participated in Genome Alberta Mountain Pine Beetle Workshop, Edmonton
Nov	C. Gibas visited the laboratory of Dr. S. Hambleton, Agriculture & Agri-Food Canada, Ottawa

Other Activities

Editorial work (LS): Journal of Clinical Microbiology (2); Medical Mycology (3); Mycoses (1); International Journal of Systematic and Evolutionary Microbiology (1); grant review (1)

Culture Collections (LS)

- In 2006, I cooperated with colleagues at Sporometrics, Inc, Toronto, ON to prepare a technical proposal for a Feasibility Study for a Decentralized Canadian Microbial Culture Collection Network Organization. This bid was approved by the CRTI (federal Chemical, Biological, Radiological and Nuclear Research and Technology Initiative) and a procedures are underway to discuss and proposed funding support for a nation-wide network of microbial culture collections.

Training

- C. Gibas spent several days training in the laboratory of Dr. Sarah Hambleton, Agriculture & Agri-Food, Canada, Ottawa where she upgraded her molecular biology skills.

University Committees (LS)

- Advisory committee for National Reference Centre in Mycology, UAH Microbiol. & Public Health

Volunteer Activities

- A. Hashimoto continues to work with the Matsukaze Chanoyu group to offer the traditional Japanese tea ceremony monthly during the summer at the DBG Ozawa Pavilion.

External Funding (Grants/Fees for Services)

NSERC Research Tools & Instruments **(new)** Thermal cycler and basic equipment for molecular characterization of fungi. Sigler, L. 2006 - 2007	28,000
NSERC Discovery **(Renewal)** Systematics of Fungi in the Human Environment Sigler, L. 2006 to 2011	31,878
NSERC. Major Facilities Access. The University of Alberta Microfungus Collection and Herbarium (UAMH). (2005-2008)	52,767
U of A Small Faculties Fund. Travel grant ISHAM, Paris, France	2,500
Income from all services cultures, services, identifications, assessments and consultation	20,000
Consultation to UAH National Reference Centre (Microbiology & Public Health)	4,500

Publications Citing UAMH Cultures or Assistance

1. Anderson H, Honish L, Taylor G, Johnson M, Tovstiuk C, Fanning A, Tyrrell G, Rennie R, Jaipaul J, Sand C, Probert S. 2006. Histoplasmosis Cluster, Golf Course, Canada. Emerging Infectious Diseases 12:163-164.

   Abstract We report a cluster of 4 cases of acute histoplasmosis (1 culture proven and 3 with positive serology, of which 2 were symptomatic) associated with exposure to soil during a golf course renovation. Patients in western Canada with compatible symptoms should be tested for histoplasmosis, regardless of their travel or exposure history.

2. Bates ST, Gundlapelly SNR, Garcia-Pichel F. 2006. Exophiala crusticola anam. nov. (affinity Herpotrichiellaceae), a novel black yeast from biological soil crusts in the Western United States. Int J Syst Evol Microbiol 56: 2697-2702.

   Abstract A novel black yeast-like fungus, Exophiala crusticola, is described based on two closely related isolates from biological soil crust (BSC) samples collected on the Colorado Plateau (Utah) and in the Great Basin desert (Oregon), USA. Their morphology places them in the anamorphic genus Exophiala, having affinities to the family Herpotrichiellaceae (Ascomycota). Phylogenetic analysis of their D1/D2 large subunit nuclear ribosomal RNA (LSU nrRNA) gene sequences suggests that they represent a distinct species. The closest known putative relative to Exophiala crusticola is Capronia coronata Samuels, isolated from decorticated wood in Westland County, New Zealand. The holotype for Exophiala crusticola anam. nov. is UAMH 10686 and the type strain is CP141bT (=ATCC MYA-3639T=CBS 119970T=DSM 16793T). Dark-pigmented fungi appear to constitute an important heterotrophic component of soil crusts and Exophiala crusticola represents the first description of a dematiaceous fungus isolated from BSCs.

3. Bois G, Bertrand A, Piche Y, Fung M, Khasa DP. 2006. Growth, compatible solute and salt accumulation of five mycorrhizal fungal species grown over a range of NaCl concentrations. Mycorrhiza 16:99-109.
   Abstract The oil sand industry in northeastern Alberta produces vast areas of severely disturbed land. The sodicity of these anthropic soils is one of the principal constraints that impede their revegetation. Previous in vitro studies have shown that the ectomycorrhizal fungi *Laccaria bicolor* (Maire) Orton UAMH 8232 and *Hebeloma crustuliniforme* (Bull) Quel. UAMH 5247 have certain salt-resistant traits and thus are candidate species for the inoculation of tree seedlings to be outplanted on salt-affected soil. In this study, the in vitro development of these fungi was compared to that of three mycorrhizal fungi [*Suillus tomentosus* (Kauff.) Sing., Snell and Dick; *Hymenoscyphus* sp. and *Phialocephala* sp.] isolated from a sodic site created by Syncrude Canada Ltd. Their growth, osmotica and Na/Cl contents were assessed over a range (0, 50, 100, 200 mM) of NaCl concentrations. After 21 days, the two ascomycetes (*Hymenoscyphus* sp. and *Phialocephala* sp.) were shown to be more resistant to the NaCl treatments than the three basidiomycete species. Of the basidiomycetes, *L. bicolor* was the most sensitive to NaCl stress, while *H. crustuliniforme* showed greater water stress resistance, and the *S. tomentosus* isolate exhibited greater Na and Cl filtering capacities and had a better biomass yield over the NaCl gradient tested. Both ascomycetes used mechanisms other than carbohydrate accumulation to palliate NaCl stress. While the *Hymenoscyphus* isolate accumulated proline in response to NaCl treatments, the darker *Phialocephala* isolate may have used compounds such as melanin. The basidiomycete species accumulated mainly mannitol and/or proline in response to increasing concentrations of NaCl.

4. Bois G, Bigras FJ, Bertrand A, Piche Y, Fung MYP, Khasa DP. 2006. Ectomycorrhizal fungi affect the physiological responses of *Picea glauca* and *Pinus banksiana* seedlings exposed to an NaCl gradient. Tree Physiology 26:1185–1196.

   Abstract We tested the effects of ectomycorrhizal (ECM) inoculation on greenhouse-grown white spruce (*Picea glauca* (Moench) Voss) and jack pine (*Pinus banksiana* L.) seedlings to be used for revegetation of salt-affected tailing sands resulting from the exploitation of oil sand in northeastern Alberta, Canada. White spruce and jack pine seedlings were inoculated with three ECM fungi selected for their in vitro tolerance to excess Na^+ and Cl^-: *Hebeloma crustuliniforme* (Bull) Quel. UAMH 5247, *Laccaria bicolor* Maire (Orton) UAMH 8232 and a *Suillus tomentosus* (Kauff.) Sing., Snell and Dick isolate from a salt-affected site. The physiological responses of the seedlings to a gradient of NaCl concentration (0, 50, 100 and 200 mM) were assessed over

four weeks by: (1) Na^+ accumulation and allocation; (2) chlorophyll a fluorescence; (3) growth, (4) water content; and (5) organic osmolyte accumulation. Jack pine seedlings were more sensitive than white spruce seedlings to increasing Na^+ and Cl^- concentrations. Both species showed decreasing biomass accumulation, and increasing concentrations of organic osmotica and Na with increasing NaCl concentration. White spruce seedlings inoculated with the *S. tomentosus* isolate had the best growth response at all NaCl concentrations tested. Although jack pine seedlings inoculated with the *L. bicolor* or *S. tomentosus* isolate exhibited the highest growth in the 50 and 100 mM NaCl treatments, both fungi increased the photochemical stress and dehydration of their hosts in the 200 mM NaCl treatment. At the latter concentration, jack pine seedlings inoculated with *H. crustuliniforme* showed the greatest tolerance to salt stress. Although the different fungi altered the physiological response of the host in different ways, inoculation with salt-stress-tolerant ECM fungi increased growth and reduced the negative effects of excess NaCl. Use of controlled mycorrhization may increase survival of coniferous seedlings used for revegetation of salt-affected sites.

5. Farr DF, Elliott M, Rossman AY, Edmonds RL. 2005. *Fusicoccum arbuti* sp. nov. causing cankers on Pacific madrone in western North America with notes on *Fusicoccum dimidiatum,* the correct name for *Scytalidium dimidiatum* and *Nattrassia mangiferae.* Mycologia 97:730-741.

Abstract Pacific madrone (*Arbutus menziesii*) is a broadleaf evergreen tree native to western North America that has been in decline for the past 30 years. A fungus has been isolated and was verified as the cause of cankers on dying trees. It was determined to belong in the genus *Fusicoccum,* an asexual state of *Botryosphaeria.* This genus in both its sexual and asexual states commonly causes canker diseases of deciduous woody plants. Using morphological and molecular data the fungus causing cankers on Pacific madrone is characterized, described and illustrated as a new species of *Fusicoccum, F. arbuti* D.F. Farr & M. Elliott sp. nov. No sexual state is known for *F. arbuti.* Evidence from the literature, cultures and specimens suggests that *F. arbuti,* often mistakenly identified as *Nattrassia mangiferae,* has been causing madrone canker since at least 1968. Authentic isolates of *Nattrassia mangiferae* as the synanamorph *Scytalidium dimidiatum* were sequenced and determined to be different from *Fusicoccum arbuti* and to belong in *Botryosphaeria/ Fusicoccum.* In addition to molecular sequence data, the morphology of the pycnidial and arthric conidial states of *Nattrassia mangiferae/ Scytalidium dimidiatum* resembles that of *Fusicoccum.* Therefore the correct name for *Nattrassia mangiferae* and its numerous synonyms (*Dothiorella mangiferae, Torula dimidata, Scytilidium dimidiatum, Fusicoccum eucalypti, Hendersonula toruloidea, H. cypria, Exosporina fawcetii, H. agathidia,* and *S. lignicola*) is *Fusicoccum dimidiatum* (Penz.) D.F. Farr, comb. nov.

6. Gagne A, Jany J-L, Bousquet J, Khasa DP. 2006. Ectomycorrhizal fungal communities of nursery-inoculated seedlings outplanted on clear-cut sites in northern Alberta. Can J For Res 36:1684-1694.

Abstract Seedlings from three conifer species (*Pinus contorta* Doug. ex Loud. var. *latifolia* Englem., *Picea glauca* (Moench) Voss, and *Picea mariana* (Mill.) BSP) were planted on two clear-cut sites in Alberta, Canada, after inoculation in the nursery with strains of six different ectomycorrhizal species (*Hebeloma longicaudum*, *Laccaria bicolor*,*Paxillus involutus*,*Pisolithus tinctorius*,*Rhizopogon vinicolor*, and *Suillus tomentosus*). Five and 6 years after planting, morphological characterization and molecular typing techniques (internal transcribed spacer – restriction fragment length polymorphism (ITS-RFLP) and simple sequence repeat (SSR) markers) were used to identify the ectomycorrhizal fungal communities and to assess the occurrence of the inoculated ectomycorrhizal fungi on host roots. Ectomy corrhi zae recovered from the roots of the planted trees on each of the two sites showed little diversity, with a total

of 16 and 19 ITS-RFLP patterns corresponding to 11 and 13 ectomycorrhizal taxa, respectively. The most abundant ectomycorrhizal fungi found on colonized roots were ascomycetes and the widespread basidiomycete *Amphinema byssoides*. Amongst the six introduced fungal strains, only *L. bicolor* UAMH 8232 was detected on one site after 5 and 6 years, as determined using six SSR markers. Although not detected after 5 years, some of the introduced strains might have had a positive effect on the early growth of the trees before their replacement by competing species, because significant differences in plot volume index were detected between inoculation and control treatments.

7. Hoog GS, Zeng JS, Harrak MJ, Sutton DA. 2006. *Exophiala xenobiotica* sp. nov., an opportunistic black yeast inhabiting environments rich in hydrocarbons. Antonie Van Leeuwenhoek. 90:257-68.

   Abstract A new black yeast species, Exophiala xenobiotica, is described, a segregant of the Exophiala jeanselmei complex. It is morphologically very similar to E. jeanselmei, though with less melanized conidiogenous cells, but deviates unambiguously on the basis of molecular phylogeny. The species is a relatively common agent of cutaneous infections in humans, whereas E. jeanselmei is associated with subcutaneous infections. Environmental strains of E. xenobiotica are frequently found in habitats rich in monoaromatic hydrocarbons and alkanes.

8. Iwamoto S, Tokumasu S, Suyama Y, Kakishima M. 2005. *Thysanophora penicillioides* includes multiple genetically diverged groups that coexist respectively in *Abies mariesii* forests in Japan. Mycologia 97:1238-1250.

   Abstract We investigated intraspecific diversity and genetic structures of a saprotrophic fungus—*Thysanophora penicillioides*—based on sequences of nuclear ribosomal internal transcribed spacer (ITS) in 15 discontinuous *Abies mariesii* forests of Japan. In such a well-defined morphological species, numerous unexpected ITS variations were revealed: 12 ITS sequence types detected in 254 isolates collected from 15 local populations were classified into five ITS sequence groups. Maximally, four ITS groups consisted of seven ITS types coexisting in one population. However, group 1 was dominant with approximately 65%; in particular, one haplotype, 1a, was most dominant with approximately 60% in respective populations. Therefore, few differences were recognized in genetic structure among local populations, implying that the gene flow of each lineage of the fungus occurs among local populations without geographic limitations. However, minor haplotypes in some ITS groups were found only in restricted areas, suggesting that they might expand steadily from their places of origin to neighboring *A. mariesii* forests. Aggregating sequence data of seven European strains and four North American strains from various substrates to those of Japanese strains, 18 ITS sequence types and 28 variable sites were recognized. They were clustered into nine lineages by phylogenetic analyses of the ß-tubulin and combined ITS and ß-tubulin datasets. According to phylogenetic species recognition by the concordance of genealogies, respective lineages correspond to phylogenetic species. Plural phylogenetic species coexist in a local population in an *A. mariesii* forest in Japan.

9. Jany J-L, Bousquet J, Gagne A, Khasa DP. 2006. Simple sequence repeat (SSR) markers in the ectomycorrhizal fungus *Laccaria bicolor* for environmental monitoring of introduced strains and molecular ecology applications. Mycological Research 110:51-59.

   Abstract Simple sequence repeat (SSR) markers were developed from SSR-enriched genome libraries for the ectomycorrhizal basidiomycete *Laccaria bicolor*. Seven markers were single-locus and amplified unambiguously in *L. bicolor*. The seven SSR markers were further characterized using an array of 15 *L. bicolor* strains representative of diverse origins worldwide. The observed number of alleles per locus varied from 5–9 and the values of observed

heterozygosity from 0.167 to 0.667. The seven SSR loci could be amplified from DNA extracted from root tips of *L. bicolor* inoculated pine seedlings. All the *L. bicolor* ectomycorrhizas analysed exhibited the same SSR multi-locus profile as that detected for the UAMH 8232 inoculant strain. The set of markers described represents a potent tool for the monitoring of introduced strains of *L. bicolor* and for molecular ecology applications.

10. Kolarik M., Slavikova E. and Pazoutova S. 2006. The taxonomic and ecological characterisation of the clinically important heterobasiodiomycete *Fugomyces cyanescens* and its association with bark beetles. Czech Mycol. 58:81–98.

    Abstract Anamorphic heterobasidiomycete, taxonomically highly related or identical with *Fugomyces cyanescens* (Basidiomycota: *Microstromatales*), formerly known mostly from the clinical material, was frequently found in association with nine phloemophagous bark beetles at eleven localities in Hungary, Bulgaria and in the Mediterranean. The isolates were identified using morphological characteristics, its physiological profile and rDNA sequences and compared with the ex-type strain. The phylogeny was studied based on LSU and ITS-rDNA analysis. The morphology and ecology of the species is discussed in relation to related taxa which occur primarily on plants (phylloplane saprobes, parasitism), but sporadically also on clinical material obtained mostly from immuno-compromised patients.

11. Lee S, Kim JJ, Breuil C. 2005. *Leptographium longiclavatum* sp. nov., a new species associated with the mountain pine beetle, *Dendroctonus ponderosae*. Mycol. Res. 109: 1162–1170

    Abstract The mountain pine beetle, Dendroctonus ponderosae, and its fungal associates are devastating the lodgepole pine forests in British Columbia, Canada. During our fungal survey, an unknown Leptographium species has been consistently isolated from both D. ponderosae and infested lodgepole pine (Pinus contorta var. latifolia). This Leptographium species has similar morphology with the Leptographium anamorph of Ophiostoma clavigerum whose association with the D. ponderosae is well known. However, thorough morphological comparisons showed that this fungus is distinct from all the other Leptographium species described in the literature, and especially from O. clavigerum. Comparison of DNA sequences of multiple loci and the profiles by the PCR-RFLP marker also confirmed that this Leptographium species represents an undescribed taxon. Based on its distinct morphological, physiological characteristics and phylogenetic position, we describe it as L. longiclavatum sp. nov.

12. Rice AV, Currah RS. 2006. Two new species of *Pseudogymnoascus* with *Geomyces* anamorphs and their phylogenetic relationship with *Gymnostellatospora.* Mycologia 98:307-318.

    Abstract Two new psychrophilic *Pseudogymnoascus* species with *Geomyces* anamorphs are described from a *Sphagnum* bog in Alberta, Canada. *Pseudogymnoascus appendiculatus* has long, branched, orange appendages and smooth, fusoid to ellipsoidal ascospores with a faint longitudinal rim. *Pseudogymnoascus verrucosus* has short, subhyaline appendages and warty peridial hyphae and ascospores, and both smooth to asperulate and irregularly warty conidia. Both species produce asci in chains, a feature that supports the distinction between this group and *Myxotrichum*, which produces asci singly. The discovery of species intermediate between *Pseudogymnoascus* and *Gymnostellatospora*, in having both ornamented ascospores and *Geomyces* anamorphs, prompted a re-evaluation of the genera. Sequence analysis of the internal transcribed spacer regions (ITS) of the nuclear ribosomal DNA indicates that the two genera remain distinct and comprise a monophyletic group. *Pseudogymnoascus* species have smooth to warty or lobate-reticulate ascospores while species of *Gymnostellatospora* have walnut-shaped spores with distinct longitudinal crests and striations. Anamorphs assignable to the form genus *Geomyces* are allied with both genera. A key is provided to the four species and varieties of

Pseudogymnoascus.

13. Skinner SJ, Tsuneda A, Currah RS. 2006. Morphology and development of the reticuloperidial ascomata of *Auxarthron conjugatum.* Mycologia 98:447-454.

Abstract Light and electron microscopy showed that the reticuloperidium of thick-walled hyphae, characteristic of the mature ascoma of *Auxarthron conjugatum*, originated from branches that grew from the broad, gyre-like hyphal loops making up the ascomatal initials. Within the developing peridium, short, acropetally proliferating chains of prototunicate asci each arose from a single crozier and matured from base to tip. The walls of young asci were two-layered but evanesced as they matured with the outer layer dissolving before the inner one. Distal asci in some chains retained the inner wall, detached from adjacent asci by septum schizolysis and when transferred to fresh media produced germ tubes and mycelium. Ultraviolet epifluorescent staining with a DNA intercalator (Hoechst) indicated that these spore-like asci probably contained diploid nuclei. In normal asci, ascospores had an inner, electron lucent primary wall and a three-layered secondary wall. The deposition pattern of the middle layer of the secondary wall created the distinctive array of pits and ridges characteristic of the ascospores in this taxon. The production of ascospores, spore-like asci and arthroconidia, along with the tendency of ascospores to adhere in a mass, is interpreted as contributing to the reproductive flexibility and inoculum potential of *A. conjugatum*. In all respects the ascomata of *A. conjugatum* differed substantially from the morphologically similar taxon, *Myxotrichum arcticum*. These findings underscore the benefit of using DNA-based phylogenies in concert with cytological and ultrastructural observations for exploring selective pressures behind homoplasious characters and revealing novel structural features.

14. Tsui CKM, Sivichai S, Berbee ML. 2006. Molecular systematics of *Helicoma, Helicomyces* and *Helicosporium* and their teleomorphs inferred from rDNA sequences. Mycologia 98:94-104.

Abstract Three genera of asexual, helical-spored fungi, *Helicoma, Helicomyces* and *Helicosporium* traditionally have been differentiated by the morphology of their conidia and conidiophores. In this paper we assessed their phylogenetic relationships from ribosomal sequences from ITS, 5.8S and partial LSU regions using maximum parsimony, maximum likelihood and Bayesian analysis. Forty-five isolates from the three genera were closely related and were within the teleomorphic genus *Tubeufia sensu* Barr (Tubeufiaceae, Ascomycota). Most of the species could be placed in one of the seven clades that each received 78% or greater bootstrap support. However none of the anamorphic genera were monophyletic and all but one of the clades contained species from more than one genus. The 15 isolates of *Helicoma* were scattered through the phylogeny and appeared in five of the clades. None of the four sections within the genus were monophyletic, although species from *Helicoma* sect. helicoma were concentrated in Clade A. The *Helicosporium* species also appeared in five clades. The four *Helicomyces* species were distributed among three clades. Most of the clades supported by sequence data lacked unifying morphological characters. Traditional characters such as the thickness of the conidial filament and whether conidiophores were conspicuous or reduced proved to be poor predictors of phylogenetic relationships. However some combinations of characters including conidium colour and the presence of lateral, tooth-like conidiogenous cells did appear to be predictive of genetic relationships.

Table 1. Cultures Received in 2006

	Person or industry or culture collection and address	Purpose	Total
1.	Bates, S., College of Liberal Arts and Sciences, School of Life Sciences, Arizona State University, Tempe, AZ	D	1
2.	Breuil, C. (Alamouti, S.), Dept. of Wood Sci., University of British Columbia, Vancouver, BC	D	38
3.	Bunn, U., Ontario Ministry of Health Lab Services, Etobicoke, ON	SEQ	2
4.	Centraalbureau voor Schimmelcultures (Snippe-Claus, F. B.), Utrecht, Netherlands	EX	3
5.	Currah, R. (Day, M., Greif, M., Davey, M., Wong, W., Skinner, S.), Dept. of Biol., Sci., Univ Alberta, Edmonton, AB	D	30
6.	Heard, D. (Schuman, C.), Veterinary Med Center, Univeristy of Florida, Gainesville, FL	ID	8
7.	Isham, N. (Powell, M.), University Hospitals of Cleveland, Case Western Reserve Univ., Dermatology, Center for Medical Mycology, Cleveland, OH	ID	2
8.	Keener, L, (Sutherland, M.), San Diego Zoo, San Diego, CA.	ID	5
9.	Magill, S.S., Infectious Diseases, Johns Hopkins School of Medicine, Baltimore, MD	ID	1
10.	Mohan, S. M., Microbiological Lab., Toronto Medical Lab & Mt. Sinai Hospital, Toronto, ON,	ID	4
11.	Pare, J., Toronto Zoo, Scarborough, ON	ID	1
12.	Reese, Paul B., University of West Indies, Kingston, Jamaica	ID/FD(1)	25
13.	Rennie, R., National Center for Mycotic Diseases, Univ Alberta Hospital, Edmonton, AB	ID	30
14.	Rogers, K., Auckland Hospital, Auckland, NZ	D	2
15.	Shea, Y., National Institutes of Health, Rockville, MD.	D	1
16.	Simor, A. (Baillie, L.), Microbiology Laboratory Centre, Sonnybrook & Women's College Health Science, Toronto, ON	ID, SEQ	1
17.	Sporometrics Inc., (Scott, J., Saleh, M.), Toronto, ON	D	8
18.	Sutton, D., Health Science Center, Univ Texas, San Antonio, TX	ID	3
19.	von Platen, J., City of St. Albert, St. Albert, AB	ID, SEQ	3
20.	Witowska, M., Ontario Ministry of Health, Mycology Lab Services, Etobicoke, ON	ID	1
21.	Woodgyer, A., Microbiological Diagnostic Unit, Univ Melbourne, Melbourne, Australia	D, ID	6
22.	Zettler, L., Dept. of Biol., Illinois College, Jacksonville, IL	D	16

Cultures received from:

1. Internal (Univ Alberta/U of A Hospitals)	60
2. External Canada	58
2. External Foreign (US, International)	73
Total cultures received	**191**

Codes: **D**= Deposit; **EX**= Exchange; **ID**= Identification, **SEQ** = Sequence

Table 2. Cultures Distributed in 2006

	Person or industry or culture collection and address	Purpose	Total
1.	Barker, J., Forest Science, Univ. British Columbia, Vancouver, BC	MR	4
2.	Berbee, M., Dept. of Botany, Univ. British Columbia, Vancouver, BC	TE	1
3.	Blackwell, M., Louisiana State University, Baton Rouge, LA	MS	2
4.	Breuil, C. (Alamouti, C.), Dept. of Wood Science, Univ. British Columbia, Vancouver, BC	T	2
5.	Canepa-Morrison, J. (DeWei, L.), Connecticut Agricultural Experiment, Windsor, CN	MS	8
6.	Catalano, G., Univ. Victoria, Science Store, Victoria, BC	MR	1
7.	Centraalbureau voor Schimmelcultures (Merkx, T., Robert, V., Verkley, G.), Utrecht, Netherlands	EX, CR	4
8.	Clean Air Lab (Sobek, E.), Research and Development, Oak Ridge, TN	IAQ	1
9.	Currah R. (Davey, M., Plishka, M.), Dept. of Biol. Sci., Univ. Alberta, Edmonton, AB	T, BD	18
10.	Doerksen, K., Fermentation Technologies AgBiotechnology Branch, Saskatoon, SK	BD	13
11.	EMSL Analytical Inc. (Hyde, J., McFarland, A.B., Cutter, C), New York, NY	IAQ	2
12.	Frigault, R. (Hock, V.), Institut National de la recherché scientifique, Quebec, QC	B?	12
13.	GAP EnviroMicrobial Services, (Shaw, J.) London, ON	IAQ	2
14.	Gruenig, C., Swiss Federal Institute of Technology Forest Pathology and Dendrology, Zurich, Switzerland	MS	5
15.	Hambleton, S., Agriculture and Agri-Food Canada, Eastern Cereal & Oilseed Research Centre, Ottawa, ON	CR	135
16.	Isotechnika Inc., (Freitag, D.), Edmonton, AB	M	3
17.	Li, Xiu-Zhen, Agriculture and AgriFood Canada, Guelph, ON	EZ?	3
18.	McCall,F., Univ. Otago, Biochem Dept., Dunedin, New Zealand	MS?	5
19.	McInerney, N., Biology Lab, Red Deer College, Red Deer, AB	TE	1
20.	Mediprobe Research Inc., (Gupta, A.K., Tighe), London, ON	RD	6
21.	Peterson, S., Microbial Properties Res, National Center for Agric. Util. Res., Peoria, IL	CR	5
22.	Pickard, M.A., Dept. of Biol. Sci., Univ. Alberta, Edmonton, AB	EZ	2
23.	Rahman, M.H., Agricultural Food and Nutritional Sci., Univ. Alberta, Edmonton, AB	PP	1
24.	Ravenbrand (Levine, W.), Shutebury, MA	B	1
25.	Reese, P.B., Dept. of Chemistry, Univ. West Indies, Kingston, Jamaica	PS (10FD)	1
26.	Reynaud, D., Dept. of Chemistry, Univ. Saskatchewan, Saskatoon, SK	PP	2
27.	Rennie, R., National Center for Mycotic Diseases, Univ. Alberta Hospital, Edmonton, AB	ST	1
28.	Shea, Y., National Institutes for Health, /CC/DLM, Bethesda, MD	MS	14
29.	Shen Health and Wellness Center (Dolinsky, T.), Edmonton, AB	QC	1
30.	Sinde, E., Hifas de Terra, Pontevedra, Spain	E	2
31.	Soares, C. (Lemos, A.), Centre for Water Studies, Cranfield University, Bedfordshire, UK	BR	1
32.	Sporometrics Inc. (B. Malloch), Toronto, ON	PT	4
33.	Vederas, J. (Li, J., Marcus, S.), Dept of Chemistry, Univ. Alberta, Edmonton, AB	M	5

Cultures distributed to:

1. Internal (Univ Alberta/UA Hospitals)	27
2. North America	190
3. International	51

Total Cultures Distributed **268**

Codes: B- Biocontrol; BD – Biodeterioration; CR – Collaborative Research; E –Edible; EX – Exchange; EZ – Enzyme; IAQ - Indoor Air Quality; M – Metabolites; MR – Mycorrhizae; MS – Molecular Systematics; PP- Plant Pathology; QC- Quality Control; PT – Proficiency Testing; PS – Preservation Service; RD – Reference Diagnostics; ST - Susceptibility Testing; T - Taxonomy, TE – Teaching