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 2001

Staff, Students

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) - **A. Flis**
Technical or laboratory assistants (trust): -**A. Hashimoto** (full time), **R. Gibas** (part-time continuing)**, V. Jajczay** (casual)**, K. Rypien** (casual to May),
Ph.D. student- **C. F. C. Gibas**
Volunteers - **R. von Tigerstrom**

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

Academic Teaching & Graduate Supervision

L. Sigler

- MMI 240 Pathogenic Bacteriology (4 lectures)
- BIOL 306 Biology of the Fungi (1 lecture)
- PHS 522 Principles of Toxicology (1 lecture)

Graduate Supervision (L. Sigler)
Connie Fe C. Gibas, Ph.D. candidate, Biological Sciences, Supervisors L. Sigler & R. Currah, Biol. Sci.
TA for BIOL 107; taught 2 laboratories for Ross Sheppard International Baccalaureate students

Graduate Supervisory(*) or Examination Committees (Sigler)
*Hyun Lee, Ph.D. Ag. Food Nutr. Science, Supervisor, J.P. Tewari, completed Dec. 2001
*A. Rice, Biological Sciences, Supervisors, R. Currah and S. Bailey

Individual Professional Training

January	3 day course for 2 individuals from White Environmental Consulting, Anchorage, Alaska, and Wade Engineering, Edmonton
March	4 day course for 3 individuals from Pharmacia Corp, Kalamazoo, MI; Texas Dept of Health, Austin, TX; Saskatchewan Health and St.Paul's Hospital, Saskatoon
July	2 day course for 1 individual from Biological Sciences, U of A
December	3 day course for 3 individuals from Molecular Epidemiology, Inc. and King County Environmental Lab., Seattle, WA

Awards

May	L. Sigler was awarded the Billy H. Cooper Meridian Award for distinguished contributions to clinical mycology by the Medical Mycological Society of the Americas, Orlando, FL.

Cultures Received, Distributed and Accessioned

Cultures received for identification, deposit or in exchange (**Table 1**) **334**

Cultures distributed on request or in exchange (**Table 2**).....**418**

Culture Collection and Herbarium Accessions

New accessions.....**219**

Total accessions.....**10132**

Information on Accessions available through print and on-line CATALOGUES

Catalogue of the University of Alberta Microfungus Collection and Herbarium. 3rd Edition. 1998
http://www.devonian.ualberta.ca/uamh/search

In-house and Collaborative Research

Refereed Journal Articles [See links on our web site]

1. Khasa, P.D.*, L. Sigler, P. Chakravarty, B.P. Dancik, L. Erickson & D. McCurdy. 2001. Effect of fertilization on seedling growth and ectomycorrhizal development of conifer seedlings in container-grown and bare-root nurseries. New Forests 22:179-197.
*Renewable Resources, U of A, now Université Laval

Abstract
Effect of three levels of fertilizer on the growth and ectomycorrhizal colonization by six species of ectomycorrhizal fungi (*Hebeloma longicaudum*, *Laccaria bicolor*, *Paxillus involutus*, *Pisolithus tinctorius*, *Rhizopogon vinicolor* and *Suillus tomentosus*) on three species of containerized-grown conifer seedlings (*Pinus contorta*, *Picea glauca*, and *Picea mariana*) and two species of bare-root conifer seedlings (*Pinus sylvestris* and *Larix sibirica*) was studied. Growth of the seedlings in both container-grown and bare-root nurseries increased as the levels of fertilizer increased. For better seedling growth and environmental quality it may be possible to reduce the level of fertilizers up to 33% by using selected mycorrhizal fungi. Ectomycorrhizal colonization in all seedlings was not affected by fertilizer levels. *Hebeloma longicaudum, L. bicolor, P. involutus*, and *P. tinctorius* formed well-developed ectomycorrhizae, whereas ectomycorrhizal development by *R. vinicolor* and *S. tomentosus* was poor. Native mycorrhizal fungi colonized non-inoculated control seedlings; however, their colonization was always lower than with inoculated fungi.

2. Dykstra, M.J.*, K.M. Astrofsky, M.D. Schrenzel, J.G. Fox, R.A. Bullis, S. Farrington, L. Sigler, M.G. Rinaldi, and M.R. McGinnis. 2001. High mortality in a large-scale zebrafish colony (*Brachydanio rerio* Hamilton & Buchanan, 1822) associated with *Lecythophora mutabilis* (van Beyma) W. Gams & McGinnis. Comp. Med 51:361-368.
* College of Veterinary Medicine, North Carolina State University, Chapel Hill, NC

Abstract
Zebrafish (*Brachydanio rerio*) have become an important model system for studying vertebrate embryonic development and gene function through manipulation of genotype and characterization of resultant phenotypes. An established research zebrafish colony without substantial disease problems for more than 7 years of operation began experiencing appreciable mortalities in November of 1997. Young fish (fry), from five to 24 days after hatching, spontaneously developed elongate strands of organic material protruding from the mouth, operculum, and anal pore, leading workers in the laboratory to describe the infected fish as "bearded." Unlike typical freshwater fish fungal infections, the skin surface did not have evidence of fungal colonization. The disease was associated with progressive lethargy, reduced feeding, and subsequent mortality. From 10 to 100% of the fry in a given tank were affected. Initial examination indicated that the biofilm around the head of affected fry consisted of bundles of septate fungal hyphae, large numbers of mixed bacterial populations, and protozoans. Environmental samples of air and water in the laboratory were obtained to ascertain the source of the infective agent and to isolate and identify the fungus. A fungus identified as *Lecythophora mutabilis* was isolated repeatedly from infected fish and water samples from infected fish tanks, and from the main laboratory water supply tanks, but not from laboratory air. Some biofilm beards on fish were found to consist of relatively

pure bacterial populations, and beards on occasional fish examined in the later part of the study consisted of hyphae and spores of the oomycete genus *Aphanomyces. Lecythophora mutabilis* did not invade tissues; however, elimination of the epizootic correlated with reduction in the number of *L. mutabilis* conidia in the water following modification of the laboratory water system by use of new filtration and sterilization systems. We conclude that the dense hyphal strands of *L. mutabilis* composing the predominant biofilm type, along with mixed bacteria and protozoa, contributed to the die-off in young fry by occluding the oral cavity and/or gills, leading to starvation and/or asphyxiation.

3. Al-Mohsen*, I.Z., D.A. Sutton, L. Sigler, E. Almodovar, N. Mahboub, H. Frayha, S. Al-Hajjar, M.G. Rinaldi, T. Walsh. 2000. *Acrophialophora fusispora* brain abscess in a child with acute lymphoblastic leukemia. Review of cases and taxonomy. J. Clin. Microbiol. 38: 4569-4576.
*King Faisal Specialist Hospital & Research Center, Riyadh, Saudi Arabia

Abstract

A 12-year-old girl with acute lymphoblastic leukemia was referred to King Faisal Specialist Hospital and Research Center. The diagnosis without central nervous system (CNS) involvement was confirmed on admission, and chemotherapy was initiated according to the Children Cancer Group (CCG) 1882 protocol for high-risk-group leukemia. During neutropenia amphotericin B (AMB) (1 mg/kg of body weight/day) was initiated for presumed fungal infection when a computed tomography (CT) scan of the chest revealed multiple nodular densities. After 3 weeks of AMB therapy, a follow-up chest CT revealed progression of the pulmonary nodules. The patient subsequently suffered a seizure, and a CT scan of the brain was consistent with infarction or hemorrhage. Because of progression of pulmonary lesions while receiving AMB, antifungal therapy was changed to liposomal AMB (LAMB) (6 mg/kg/day). Despite 26 days of LAMB, the patient continued to have intermittent fever, and CT and magnetic resonance imaging of the brain demonstrated findings consistent with a brain abscess. Aspiration of brain abscess was performed and the Gomori methenamine silver stain was positive for hyphal elements. Culture of this material grew *Acrophialophora fusispora*. Lung biopsy showed necrotizing fungal pneumonia with negative culture. The dosage of LAMB was increased, and itraconazole (ITRA) was added; subsequently LAMB was discontinued and therapy was continued with ITRA alone. The patient demonstrated clinical and radiological improvement. In vitro, the isolate was susceptible to low concentrations of AMB and ITRA.

A. fusispora is a thermotolerant, fast-growing fungus with neurotropic potential. We report the first case of human infection involving the CNS. *Acrophialophora* resembles *Paecilomyces* but differs in having colonies that become dark and in the development of phialides along the sides or at the tips of echinulate brown conidiophores. Conidia are borne in long chains and are smooth or ornamented with fine-to-coarse echinulations, sometimes in spiral bands. The taxonomy of the genus *Acrophialophora* is reviewed, and *Acrophialophora nainiana* and *Acrophialophora levis* are considered as synonyms of *A. fusispora*.

Publications Arising from Thesis of S. Abbott

4. Abbott, S.P.* and L. Sigler. 2001. Heterothallism in the Microascaceae demonstrated by three species in the *Scopulariopsis brevicaulis* series. Mycologia 93:1211-1220.
*current address a.k.a.MOLDLAB, Sparks, Nevada

Abstract

Scopulariopsis anamorphs are known for many species of the genus *Microascus* (Ascomycota, Microascaceae), but teleomorph connections for anamorphic species within the '*Scopulariopsis brevicaulis* series' are tenuous or lacking. *Microascus brevicaulis* was recently described as the teleomorph of the type and commonest species, *S. brevicaulis*, but only a few isolates yielded fertile perithecia. To investigate whether paucity of sexual reproduction was the result of heterothallism, mating experiments were conducted among isolates representing the species *S. brevicaulis*, *S. candida*, *S. asperula*, *S. fusca* and *S. koningii*. Results demonstrated heterothallism within three species and confirmed that two taxa could be reduced to synonymy. Three holomorph species, *M. brevicaulis*, *M. manginii*, and *M. niger*, are recognized to include anamorphs *S. brevicaulis* (synonym *S. koningii*), *S. candida*, and *S. asperula* (synonyms *S. arnoldii*, *S. bestae*, *S. fusca*, and *S. roseola*), respectively. *Microascus niger* is redescribed and a neotype proposed. The three species are most readily recognized by colony color (sandy tan to avellaneous in *M. brevicaulis*, white to cream in *M. manginii*, and medium to dark fuscous brown in *M. niger*). These colonial distinctions correlate generally with conidia that are coarsely roughened, smooth, or finely roughened, respectively. However, conidium ornamentation, previously considered a reliable taxonomic character, is shown to be variable.

5. Sean P. Abbott, T.C. Lumley and L. Sigler. Use of holomorph characters to delimit Microascus nidicola and M. soppii sp. nov., with notes on the genus Pithoascus. Mycologia (in press; acc. Sept 2, 2001)

In Press Refereed Articles

6. Thomas, A.D., L. Sigler, S. Peucker, J.H. Norton & A Nielan. 2001. *Nannizziopsis vriesii*-like fungus associated with fatal cutaneous mycoses in the salt-water crocodile (*Crocodylus porosus*). Med. Mycol. 39 (acc July 01)
7. Leotta, G.A., J.A. Paré, L. Sigler, D. Montalti, G. Vigo, M. Petruccelli, and E.H. Reinoso. 2002. *Thelebolus microsporus* mycelial mats in the trachea of wild brown skua (*Catharacta antarctica lonnbergi)* and South Polar skua (*C. maccormicki*) carcasses. Journal of Wildlife Diseases 38(2): in press (acc 12 Oct. 01)
8. Bibashi, E., E. Kololina, L. Sigler, D. Sofianou, D. Tsakiris, G. Visvardis, M. Papadimitriou, and D. Memmos. Three cases of uncommon fungal peritonitis in patients undergoing peritoneal dialysis. Peritoneal Dialysis International (acc Dec 27, 2001)
9. Hayashi, S, K. Naitoh, S. Matsubara, Y. Nakahara, Z. Nagasawa, I. Tanabe, K. Kusaba, J. Tadano, K. Nishimura, L. Sigler. Pulmonary colonization by *Chrysosporium zonatum* associated with allergic inflammation in an immunocompetent subject. J. Clin. Microbiol. (in press, accepted Jan 2, 2001)

Published Proceedings and Abstracts

Proceedings

10. Paré, JA, L. Sigler, K.L. Rypien, C.F. Gibas and T.L. Hoffman. 2001. The cutaneous fungal microflora of healthy squamate reptiles and prevalence of the *Chrysosporium* anamorph of *Nannizzopsis vriesii*. Proc. Am. Assoc. Zoo Vet./Assoc of Reptilian & Amphibian Vet. Joint Ann. Mtg. Orlando, Sept. p 36-38. (oral)
11. Bibashi, E., E. Kololina, L. Sigler, D. Sofianou, D. Tsakiris, A. Papagianni, G. Visvardis, and D. Memmos. 2001. Uncommon causes of fungal peritonitis in patients undergoing peritoneal dialysis. Proc. 5th Congress Balkan Cities Assoc. Nephrology, Dialysis, Transplantation and Artificial Organs, Sept. pp 223-225. (oral)

Abstracts

12. Sigler, L., R.C. Summerbell, T. Walsh, A. Sarabia, V.L. Anderson, S.M. Holland. 2001. *Penicillium* (*Geosmithia*) *argillaceum* causing invasive infection in a patient with chronic granulomatous disease. American Society for Microbiology Annual Mtgs, Orlando, FL, F-138, May. (poster)
13. Pare, J. & L. Sigler. 2001. *Nannizziopsis vriesii*, an emerging fungal pathogen of reptiles. 6th Int. Conference on the Pathology of Amphibians and Reptiles, St.-Paul, MN, April. (oral)
14. Bibashi, E., E. Kokolina, L. Sigler, D. Sofianou, and D. Memmos. 2001. Uncommon causes of fungal peritonitis in patients undergoing peritoneal dialysis: a report of four cases during a 10-year period. Mycoses 44 (Supp. 1):8. (oral)

Depository and Advisory Services

Cultures are received for deposit, identification or verification. Additionally, we provide advice on fungus biology or significance of mold growth, and assistance with problems of fungal contamination or deterioration. Listed are some examples of individuals or agencies using these services in 2001.

- Barnard, R.J., Microbiology, Queen Elizabeth Hospital, Norfolk, England deposit of isolates of *Onychocola canadensis* from cases of onychomycoses.
- Bibashi, E., Hippokration General Hospital, Thessaloniki, Greece, identification of an isolate from a patient on dialysis who developed peritonitis (see Bibashi et al, ref. # 8 above).
- Hill, Dr. D., St. Mary's Hospital, Waterbury, CT, a suspected isolate of *Schizophyllum commune* from pulmonary specimen was determined to be a different basidiomycete.
- Iwen, P., Univ. Nebraska Medical Center, Omaha, NE, a *Rhizomucor* isolate from sphernoid mucosa of a cancer patient sent for morphological confirmation.
- Kammeyer, P., Loyola Univ. Medical Center, Chicago, IL, *Lasiodiplodia theobromae* confirmed from onychomycosis.
- Kibsey, P., Victoria General Hospital, Victoria, BC, several isolates of *Cryptococcus neoformans* var. *gattii* from an outbreak on Vancouver Island, sent for deposit.
- Mohan, S., Microbiology, Toronto Medical Laboratories, Toronto, ON, an *Acremonium* causing abscess in thigh of male patient.
- McGinnis, M., Pathology, Univ. Texas Medical Branch, Galveston, TX, a coelomycete sent for confirmation.
- Padhye, A.A., Centers for Disease Control, Atlanta, a nonsporulating atypical dermatophyte from a patient in India determined as *Trichophyton rubrum.*
- Reimer, J., Rood & Riddle Equine Hospital, Lexington, KY, identification of an isolate from pleural fluid of a broodmare with pericarditis, following an outbreak of unexplained mortality among newborn foals in Kentucky.
- Vega, F. and F. Infante, BARC, Beltsville, MD, identification of 73 isolates obtained from insect or frass of coffee berry borer, *Hypothenemus hampei*, in Mexico

Medical Reference Service

The following individuals or agencies regularly send isolates mainly for identification.

- A. Espinel-Ingroff, Medical Mycology Research Lab, Division of Infectious Disease, Richmond, Virginia, (4)
- J. Owen, Texas Department of Health, Austin, TX (25)
- A. Padhye, Centers for Disease Control, Atlanta, GA (5)
- R. Rennie, National Reference Centre, Microbiology & Public Health, Univ. of Alberta Hospitals, (27)
- M.G. Rinaldi, Fungus Testing Branch, Dept of Pathology, University of Texas at San Antonio (1)
- K. Rogers, Auckland Hospital, Auckland, NZ (15)
- G. St-Germain, Laboratorie de Sante Publique du Quebec, Ste-Anne-de Bellevue, PQ (16)

Environmental

Various public and private agencies and members of the public contact us concerning assessment, significance and control of molds in the indoor environment. We examine bulk and air samples for presence of molds and evaluate numbers and types, and potential health hazards of exposure. In 2001, about 30 reports were prepared on samples from homes and public buildings in Alberta, Saskatchewan and B.C. Agencies included Prince Albert Grand Council, Read, Jones Christofferson, Wade Engineering, Koliger Schmidt, Main Street, Lynch Building Inspection Service Ltd., environmental health inspectors for various regional health authorities, etc.

Presentations, Travel

May	L. Sigler presented a poster at American Society for Microbiology Annual Meetings, Orlando, FL. LS attended, and helped to set up, workshop given by R. Summerbell, on *Pathogenic species of Fusarium, Acremonium and Trichoderma and their contaminating cousins* cosponsored by US National Laboratory Training Network and Texas Dept of Health, in Orlando.
June	UAMH tours for different groups of the Devonian Botanic Garden Crafters
August	Arlene Flis presented information on UAMH at the annual "Mushroom Magic" demonstration and display organized by the Edmonton Mycological Society.
May-Oct	As part of the Matsukaze Chanoyu group, Atsumi Hashimoto offered traditional Japanese tea ceremony monthly during the summer at the Ozawa Pavilion. The ceremony was also performed for the Japanese Women's Literature Conference (July) and for a course in East Asian Studies (Oct.)

Visitors

January	D. Wilson, Wade Engineering, Edmonton, AB
	M. White, White Environmental Consultants Inc., Anchorage, Alaska
March	A. Stanchina, Pharmacia Corp, Kalamazoo; MI
	J. Owen , Texas Dept of Health, Austin, TX
	R. Olesko & S. Sigfusson, St.Paul's Hosp., Saskatoon.
July	R. Summerbell, Centraalbureau voor Schimmelcultures, Utrecht, The Netherlands
August	A. Suzuki, Univ. of Alberta, Edmonton, AB
	K. Ikehata, Univ. of Alberta, Edmonton, AB
August	K. Romanyk, Univ. of Alberta, Edmonton, AB
December	J. Stewart, G. Ma and D. Alfi, Molecular Epidemiology, Inc., King County Environmental Lab., Seattle, WA

Miscellaneous Activities

Editorial Boards and peer review of papers and grant applications (LS): Editorial Board, Medical Mycology (International Society for Human and Animal Mycology) (2); Journal of Clinical Microbiology, American Society for Microbiology (4); Canadian Journal of Botany (2); Canadian Journal of Microbiology (1). NSERC individual grant (Plant Biology & Food Science) (2); Czech Academy of Science (1)

Offices in Societies and Committee work (LS)

- Secretary, Canadian Society for Medical Mycology, 1996 - present
- Member of the International Union of Biological Sciences (IUBS) World Federation of Culture Collections Committee on Postal, Quarantine and Safety, 1995- present [This committee keeps informed of changes in

regulations and prepares reports for members of the WFCC. For example, for a meeting in Brussels, the committee proposed a lowering of transport regulations for certain Risk level 2 organisms using as a model the Canadian regulations. My membership on this committee led to a call from Stephen Engelberg of New York Times relating to anthrax holdings in culture collections]

- Member, Mycological Society of America Committee on Culture Collections, 1999 – present. [Constraints on transport of cultures is a continuing concern to culture collections and users. An objectives of this committee is to ensure that user access to microbial resources is not impeded.]
- Member, American Academy of Microbiology Selection Committee, J. Roger Porter Award, 1997 – 2001

University Committees (LS)

- Member, Advisory committee for selection of the Director of the Devonian Botanic Garden (2001)
- Member of advisory committee for National Reference Centre in Mycology, UAH Microbiol. & Public Health

External Funding (Grants/Fees for Services)

Renewal / New

NSERC Individual. Systematics of microfungi in the human environment.	29,000
NSERC Equipment. Video imaging system for real-time screen imaging and dual-port camera for microscope.	26,000
EFF SAS Upgrade to research microscope.	5,000
Morris Animal Foundation. J. Pare [PI] with L. Sigler, K. Coyle, C.J. Czuprynski, Investigation of the pathogenicity of *Nannizziopsis vriesii* for reptiles.	21,000 US

Continuing

NSERC. Major Facilities Access (1999-2002). The University of Alberta Microfungus Collection and Herbarium (UAMH).	40,000
Income from services	
cultures, safe deposit and preservation services	18,000
identifications	6,000
environmental assessments and consultation	4,000
individual training	8,000
Consultation to UAH National Reference Centre (transfer from Microbiology & Public Health)	4,500

Publications Concerning UAMH Cultures or Assistance

15. Auclair, K., A. Sutherland, J. Kennedy, D.J. Witter, J.P. Van den Heever, C.R. Hutchinson & J.C. Vederas. 2000. Lovastatin nonaketide synthase catalyzes an intramolecular diels-alder reaction of a substrate analog. J. Am. Chem. Soc. 122:11519-11520.

16. Auclair, K, J. Kennedy, C.R. Hutchinson & J.C. Vederas. 2001. Conversion of cyclic nonaketides to lovastatin and compactin by a lovC deficient mutant of *Aspergillus terreus.* Bioorg. Med. Chem. Lett., 11:1527-1531.

    Abstract

    Investigation of the post-PKS biosynthetic steps to the cholesterol-lowering agent lovastatin (1) using an Aspergillus terreus strain with a disrupted lovC gene, which is essential for formation of 4a,5-dihydromonacolin L (3), shows that 7 and 3 are precursors to 1, and demonstrates that lovastatin diketide synthase (lovF protein) does not require lovC.

17. Bibashi, E. Fungal peritonitis in patients in CAPD. 2000. Thesis. Aristotle Univ. of Thessaloniki. Greece

18. Blenis, P.V. & P.S. Chow 2001. Inoculation of *Populus tremuloides* with *Pollaccia americana*. Can. J. Plant Pathol. 23: 149-157.

    Abstract

    Disease resistance may represent the best approach for controlling shoot blight, caused *by Pollaccia americana* Ondrej, in aspen (*Populus tremuloides* Michx.) plantations. Experiments were conducted to develop methods for screening for resistance under greenhouse conditions. Chickpea agar supported abundant inoculum production. An inoculum concentration of 5X104 spores/mL and a seedling age of 5-9 weeks were appropriate for evaluating infection. Infection severity was not correlated with tree height or leaf number. Differences in

infection among clones varied with fungal isolate. The number of isolates and replicates needed to detect resistance differences among clones was calculated using estimated values of experimental error and cloneXisolate interactions.

19. Buzina, W., Lang-Loidolt, D., Braun, H., Freudenschuss, K.,and H. Stammberger. 2001. Development of molecular methods for identification of *Schizophyllum commune* from clinical samples. Journal of Clinical Microbiology. 39:2391-2396.

Abstract
In the last 50 years, to our knowledge, only 16 cases of diseases caused by *Schizophyllum commune* in humans have been reported. Within only 6 months, we found four isolates of this basidiomycetous fungus, obtained from patients suffering from chronic sinusitis. The cultures of the isolated fungi showed neither clamp connections nor fruiting bodies (basidiocarps), which are distinctive features for *S. commune*, but fast-growing cottony white mycelium only. This was harvested, and DNA was extracted. The internal transcribed spacer region of the ribosomal DNA (rDNA) was amplified with fungus-specific primers, and the PCR products were sequenced. Two strains of *S. commune*, collected from branches of a European hornbeam (*Carpinus betulus*) and a tree of heaven (*Ailanthus altissima*), respectively; four specimens from the herbarium of the Institute of Botany, Karl-Franzens-University Graz; and two strains from internationally known culture collections (CBS 340.81 [ATCC 44201] and CBS 405.96) were investigated in the same way. The sequence data of all strains were compared and showed homology of over 99% in this 660-bp-long fragment of rDNA. With these results, a map of restriction enzyme cutting sites and a primer set specific for *S. commune* were created for reliable identification of this human pathogenic fungus.

20. Haugland, R.A., Vesper, S.J.,and S.M. Harmon. 2001. Phylogenetic relationships of *Memnoniella* and *Stachybotrys* species and evaluation of morphological features for *Memnoniella* species identification. Mycologia 93:54-65.

Abstract
Members of the anamorphic fungal genus *Memnoniella* demonstrate morphological and biological similarities to species within the genus *Stachybotrys*, and the taxonomic distinctions between the genera have been the subject of controversy in the past. Sixteen strains representing described species of *Memnoniella* were examined for morphology using light and scanning electron microscopy and for phylogenetic relationships using comparative sequence analysis of a segment of the nuclear ribosomal RNA gene operon (rDNA) including the internal transcribed spacer 1 and 2 regions (ITSI and ITS2) and 5.8S gene. These analyses resolved the *Memnoniella* strains into two highly divergent phylogenetic clades with morphologies generally consistent with the current descriptions of *M. echinata* and *M. subsimplex*. One strain, showing morphological features more similar to *M. subsimplex*, was placed in the *M. echinata* clade in the phylogenetic analysis and probably represents a new species. A second strain, showing a typical *M. echinata* DNA sequence, showed morphological features that were similar to *Stachybotrys* species when grown on certain culture media. The evolutionary relationships between the genera were evaluated by phylogenetic analyses of sequence data from the 18S, 28S, 5.8S rDNA genes and ITS1 and ITS2 regions. Results of several different analyses were in agreement in indicating that *Memnoniella* is paraphyletic to *Stachybotrys*.

21. Johansson, M. 2001. Fungal associations of Danish *Calluna vulgaris* roots with special reference to ericoid mycorrhiza. Plant and Soil 231:225-232.

Abstract
Fungi were isolated from young, serial-washed roots of *Calluna* sampled from a Danish heathland, Hjelm Hede. Of the 626 isolates, those that were dark, sterile and septate were divided into 13 morphological groups based on their appearance in culture on malt agar. Mycorrhizal synthesis in vitro showed that several groups formed typical ericoid mycorrhiza with seedlings of *Calluna*; these ericoid mycorrhizal fungi were morphologically similar to *Hymenoscyphus ericae*. The identities of the other dark, septate fungi are uncertain. *Oidiodendron* spp. were isolated in a very low frequency; these fungi also formed typical ericoid mycorrhiza. The *Calluna* root system on Hjelm Hede demonstrated a high morphological diversity among the associated dark, septate fungi suggesting that more than one fungus could coexist in the same host root system.

22. Kalgutar, R.M. & J. Jansonius. 2000. Synopsis of fossil fungal spores, mycelia and fructifications.Am. Assoc. of Stratigraphic Palynologists Foundation, Dallas, 423 pp.

23. Koufopanou, V., A. Burt, T. Szaro, J.W. Taylor. 2001. Gene genealogies, cryptic species, and molecular evolution in the human pathogen *Coccidioides immitis* and relatives (Ascomycota, Onygenales). Mol. Biol. Evol. 18:1246-1258.

Abstract
Previous genealogical analyses of population structure in *Coccidioides immitis* revealed the presence of two cryptic and sexual species in this pathogenic fungus but did not clarify their origin and relationships with respect to other taxa. By combining the *C. immitis* data with those of two of its closest relatives, the free-living saprophytes *Auxarthron zuffianum* and *Uncinocarpus reesii*, we show that the *C. immitis* species complex is monophyletic, indicating a single origin of pathogenicity. Cryptic species also were found in both *A. zuffianum* and *U. reesii*, indicating that they can be found in both pathogenic and free-living fungi. Our study, together with a few others, indicates that the current list of known fungal species might be augmented by a factor of at least two. However, at least in the *C. immitis*, *A. zuffianum*, and *U. reesii* complexes, cryptic species represent subdivisions at the tips of deep monophyletic clades and thus well within the existing framework of generic classification. An analysis of silent and expressed divergence and polymorphism values between and within the taxa identified by genealogical concordance did not reveal faster evolution in *C. immitis* as a consequence of adaptation to the pathogenic habit, nor did it show positive Darwinian evolution in a region of a dioxygenase gene (tcrP gene coding for 4-HPPD) known to cause antigenic responses in humans. Instead, the data suggested relative stasis, indicative of purifying selection against mostly deleterious mutations. Two introns in the same gene fragment were considerably more divergent than exons and were unalignable between species complexes but had very low polymorphism within taxa.

24. Lumley, T.C., Gignac, L.D.,and R.S. Currah. 2001. Microfungus communities of white spruce and trembling aspen logs at different stages of decay in disturbed and undisturbed sites in the boreal mixedwood region of Alberta. Can. J. Bot. 79:76-92.

Abstract
Fallen logs of trembling aspen (*Populus tremuloides*) and white spruce (*Picea glauca*) at various stages of decomposition were sampled from undisturbed and 1-, 14-, and 28-year-old post-fire and post-harvest sites in northern Alberta, Canada, and studied for differences in the associated microfungus communities. Wood samples were plated directly onto each of six different media and, from these, fungal species were identified and enumerated over a 24-month period. Approximately 10000 isolates were obtained, representing 292 species of filamentous microfungi, including 41 ascomycetes, 29 zygomycetes, and 222 mitosporic fungi. The most commonly isolated species were *Trichoderma viride, Rhinocladiella atrovirens, Penicillium pinophilum* and *Mortierella ramanniana*. Cluster analysis and ordination of microfungus communities in logs showed that the tree species of the log had the greatest influence on the species composition of communities. Fungus community composition was also correlated with the stage of decomposition. Species richness was highest in logs from undisturbed sites and lowest in logs from the most recently disturbed sites. Species diversity (Shannon-Weaver) was only slightly higher at undisturbed sites than at disturbed sites. The most significant environmental factor was log moisture, which increased proportionately with stage of decomposition and was significantly correlated with climatic factors. Modes of cell-wall degradation *of Sphagnum fuscum* by *Acremonium* cf. *curvulum* and *Oidiodendron maius*.

25. Rice, A.V.,and R.S. Currah. 2001. Physiological and morphological variation in *Oidiodendron maius*. Mycotaxon 79:383-396.

Abstract
A collection of 22 isolates of the hyphomycete *Oidiodendron maius* from soil, peat, wood and ericoid mycorrhizas in northern Europe and North America was examined using 16 simple physiological tests, SEM, and light microscopy. Twenty-one of the isolates were similar in gross cultural morphology, in being uniformly acidophilous, in their intolerance to high salt concentrations, and in having temperature optima around 20-25 C. SEM examination of conidia showed that although shape could vary substantially within a single chain, surface ornamentation was uniform among isolates and because of fine asperulations on a perispore membrane. Conidiopore length, traditionally relied upon for species determinations in the genus, was too variable among the isolates to be a definitive character. The morphological, physiological, and ecological features examined did not indicate that subspecific taxa occur within *O. Maius.* An isolate that had been included due to a previous misidentification, showed substantial physiological differences from the other 21 *O. maius* isolates. In addition to fine differences in culture, this isolate also had a unique conidial perispore confirming its lack of taxonomic relationship to the other isolates.

26. Sugiyama,M. and T. Mikawa. 2001. Phylogenetic analysis of the non-pathogenic genus *Spiromastix* (Onygenaceae) and related onygenalean taxa based on large subunit ribosomal DNA sequences. Mycoscience 42: 413-421.

Abstract
The phylogenetic positioning of the non-pathogenic genus *Spiromastix* in the Onygenales was studied based on large subunit rDNA (LSU rDNA) partial sequences (ca.570bp.). Four *Spiromastix* species and 28 representative taxa of the Onygenales were newly sequenced. Phylogenetic trees were constructed by the neighbor-joining (NJ) method and evaluated by the maximum parsimony (MP) method with the data of 13 taxa retrieved from DNA databases. *Spiromastix* and dimorphic systemic pathogens, *Ajelllomyces* and *Paracoccidioides*, appear to be a monophyletic group with 74% bootstrap probability (BP) in the NJ tree constructed with the representative taxa of the Onygenales. The tree topology was concordant with the NJ tree based on SSU rDNA sequences of our previous work and corresponded to the classification system of the Onygenales by Currah (1985) and its minor modification by Udagawa (1997) with the exception of the classification of the Onygenaceae. The Onygeneceae sensu Udagawa may still be polyphyletic, since three independent lineages were recognized. The taxa forming helicoid peridial appendages were localized to two clades on the tree. The topology of the NJ tree constructed with *Spiromastix* and its close relatives suggested that the helicoid peridial appendages were apomorphic and acquired independently in the two clades of the Onygenales.

27. Tinoco, R., Pickard, M.A.,and R. Vasquez-Duhalt. 2001. Kinetic differences of purified laccases from six *Pleurotus ostreatus* strains. Lett. App. Microbiol. 32:331-335.

Abstract
Aims: Enzyme kinetics of purified laccases from six different *Pleurotus ostreatus* strains were determined in the oxidation of syringaldazine, guaiacol and ABTS. Methods and Results: Significant differences in the kinetic constants were found. Catalytic activity (kcat) ranged from 19 to 941 U mg-1 for syringaldazine, from 18 to 1565 U mg-1 for ABTS, and from 4 to 44 U mg-1 for guaiacol. The apparent affinity constants (KM) also showed significant differences between the different strains, from 12 to 52 mumol l-1 for syringaldazine, from 8 to 79 mumol l-1 for ABTS, and from 0.46 to 6.61 mmol l-1 for guaiacol. No differences were found either on the effect of increasing concentrations of organic solvent (acetonitrile) or on the activity pH profile. The temperature profile was the same for all the *P. ostreatus* strains, except for the IE8 strain, which seems to be more sensitive to temperature. The kinetic and stability data from the six P. ostreatus strains were also compared with those obtained from other white rot fungi, *Coriolopsis gallica* and *Trametes versicolor*, showing clear differences. Conclusions: The different *P. ostreatus* isolates showed different kinetic constants. Significance and Impact of the Study: The different enzymatic properties of laccases from various *P. ostreatus* strains should be considered for a potential industrial or environmental application.

28. Tsuneda, A., Thormann, M.N.,and R.S. Currah. 2001. Modes of cell-wall degradation of Sphagnum fuscum by *Acremonium* cf. *curvulum* and *Oidiodendron maius*. Can. J. Bot. 79:93-100.

Abstract
Electron microscopy of cryo-fractured hyaline leaf cells of *Sphagnum fuscum* revealed that their cell walls consist of three layers: a thick central layer flanked on either side by a thinner, amorphous layer. *Acremonium cf. curvulum* and *Oidiodendron maius*, both isolated from partly decomposed *S. fuscum* plants collected from a boreal bog were capable of degrading leaf cell walls of Sphagnum. Where hyphae of *A. curvulum* accumulated, the amorphous, outer wall layer of *S. fuscum* was first fragmented and then removed. The exposed central wall layer consisted of bundles of microfibrils embedded in an amorphous matrix material. After the matrix material and the inner surface wall layer were mostly removed, degradation of microfibrils occurred and localized voids were produced. Unlike *A. cf. curvulum*, *O. maius* degraded all wall components more or less simultaneously. In both fungi, active and autolysing hyphae frequently occurred in proximity on the *Sphagnum* leaves.

29. Vralstad, T., Fossheim, T.,and T. Schumacher. 1999. *Piceirhiza bicolorata* – the ectomycorrhizal expression of the *Hymenoscyphus ericae* aggregate?. New Phytol. 145:549-563.

Abstract
The mycobionts of *Piceirhiza bicolorata*, a distinct ectomycorrhizal morphotype of conifers and hardwoods, have been identified by internal transcribed spacer 1 (ITS1) nuclear ribosomal DNA (rDNA) sequence comparison of the fungi involved. Samples of icolorata were obtained from seedlings of *Picea abies, Pinus sylvestris, Betula pubescens, Populus tremula, Quercus robur* and *Salix phylicifolia*. In an initial screening, the fungus amplified with universal ITS primers from ectomycorrhizal root samples of *P. bicolorata* shared approx. 95% ITS1 sequence identity with the ericoid mycorrhizal fungus *Hymenoscyphus ericae*. A total of 77 out of 88

(= 87.5%) DNA samples (i.e. 52/56 root samples and 25/32 axenic culture isolates) of *P. bicolorata* were successfully amplified with a taxon-selective primer designed for exclusive amplification *of H. ericae*-like strains. Forty-seven amplicons were sequenced, yielding 15 different ITS1 genotypes that differed by 1-14 nucleotide character state changes. An inferred ITS1 phylogeny (maximum parsimony) showed that a single major evolutionary lineage of *P. bicolorata* embraced the historically important *H. ericae* isolates in a 100% bootstrap-supported clade. The 15 *P. bicolorata* genotypes were positioned in four subclades, roughly corresponding to morphological groups of *P. bicolorata* isolates observed in axenic culture. Culture isolates of *H. ericae* and *P. bicolorata* share some common morphological features including slow, dense growth and formation of short aerial hyphal aggregates. Our results suggest that members of the *H. ericae* aggregate participate in the formation of the distinct ectomycorrhizal morphotype *P. bicolorata*. This opposes the widely accepted discrimination of ericoid and ectomycorrhizal mycobionts of the boreal forest ecosystem. The high prevalence of the *P. bicolorata* morphotype on pioneer seedlings of *P. sylvestris, B. pubescens* and *S. phylicifolia* at a copper mine spoil was remarkable. Hypotheses of possible nutrient mobilization and detoxification potentials of the fungal associates of *P. bicolorata* are discussed. We hypothesize that ericoid and ectomycorrhizal plants may share mycobionts of the *H. ericae* aggregate.

30. Wang, Y., Vasquez-Duhalt, R.,and M.A. Pickard. 2001. Effect of growth conditions on the production of manganese peroxidase by three strains of *Bjerkandera adusta*. Canadian Journal of Microbiology. 47:277-282.

Abstract

We were looking for a strain of *Bjerkandera adusta* that produces high titres of manganese peroxidase under optimal conditions for large-scale enzyme purification. We have chosen two strains from the University of Alberta Microfungus Collection and Herbarium, UAMH 7308 and 8258, and compared the effects of growth conditions and medium composition on enzyme production with the well-characterized strain BOS55 (ATCC 90940). Of four types of cereal bran examined, rice bran at 3% (w/v) in 60 mM phosphate buffer pH 6 supported the highest levels of enzyme production. Using 100 mL medium in 500-mL Erlenmeyer flasks, maximum enzyme levels in the culture supernatant occurred after about 10 days of growth; 5.5 U x mL(-1) for UAMH 7308, 4.4 U x mL(-1) for UAMH 8258, and 1.7 U x mL(-1) for BOS55, where units are expressed as micromoles of Mn-malonate formed per minute. Growth as submerged cultures in 10-L stirred tank reactors produced 3.5 U x mL(-1) of manganese peroxidase (MnP) by UAMH 8258 and 2.5 U x mL(-1) of MnP by 7308, while enzyme production by BOS55 was not successful in stirred tank reactors but could be scaled up in 2-L shake flasks containing 400 mL rice bran or glucose - malt - yeast extract (GMY) - Mn-glycolate medium to produce MnP levels of 1.7 UcntdotmL-1. These results show that the two strains of *B. adusta*, UAMH 7308 and 8258, can produce between two and three times the manganese peroxidase level of *B. adusta* BOS55, that they are good candidates for scale up of enzyme production, and that the rice bran medium supports higher levels of enzyme production than most previously described media.

Table 1. Cultures Received in 2001

Person, industry or culture collection and address	*Reason for shipment*	*Total*
1. Barnard, R.J., Microbiology, Queen Elizabeth Hospital, Norfolk, England	D	10
2. Berbee, M., (T. Allen), Botany, Univ. British Columbia, Vancouver, BC	D, ID	13
3. Berch, S. (C. Woon) Research Branch Lab, BC Ministry of Forests, Victoria, BC	D	3
4. Bibashi, E., Hippokration General Hospital, Thessaloniki, Greece	ID	1
5. Currah, R. S. (M. Thormann, M. Schulz), Biological Sciences, Univ. Alberta, Edmonton, AB	D, ID	49
6. Espinel-Ingroff, A., Medical Mycology Research Lab., Virginia Commonwealth Univ., VA	ID	4
7. Goatcher, L., Edmonton Power Corp. (EPCOR) Water Services, Edmonton, AB	ID	3
8. Herrera, J., Truman State University, Kirksville, MO	ID, D	1
9. Hill, D., St. Mary's Hospital, Waterbury, CT	ID	1
10. Iwen, P., Univ. Nebraska Medical Center, Omaha, NE	D	1
11. Kammeyer, P., Loyola Univ. Medical Center, Chicago, IL	ID	3
12. Kernaghan, G., Renewable Resources, Univ. Alberta, Edmonton, AB	D	3
13. Kibsey, P., Victoria General Hospital, Victoria, BC	D, ID	4
14. Mohan, S., Toronto Medical Laboratories, Mt. Sinai Hospital, Toronto	ID	1
15. Monreal, M., Brandon Research Centre, Agric. & Agri-Food Canada, Brandon, MB	D	1
16. McGinnis, M., Pathology, Univ. Texas Medical Branch, Galveston, TX	ID	1
17. Padhye, A.A., Emerging Pathogens, Centers for Disease Control (CDC), Atlanta, GA	D, ID	5
18. Pare, J., Univ. Wisconsin, Madison, WI	ID	25
19. Peterson, S., NRRL, USDA Agricultural Research Service, Peoria, IL	D	4
20. Reid, J., Univ. Manitoba, Winnipeg, MB	D	10
21. Reimer, J., Rood & Riddle Equine Hospital, Lexington, KY	ID	1
22. Rennie, R., (C. Sand), National Centre for Mycotic Diseases, Univ. Alberta Hospital, Edmonton, AB	D, ID	27
23. Rinaldi, M. (D. Sutton), Univ. Texas Health Science Center, San Antonio, TX	ID	1
24. Rogers, K., Auckland Hospital, Auckland, New Zealand	ID	15
25. Rossman, A., Beltsville Agric. Research Center (BARC), USDA-ARS, Beltsville, MD	D	1
26. St-Germain, G., Lab de Sante Publique du Quebec, Ste. Anne de Bellevue, PQ	ID	16
27. Suzuki, A., Univ. of Chiba, Chiba, Japan	D	22
28. Texas Dept. of Health J. Owen), Austin, TX	ID	25
29. Vega, F. (F. Infante), BARC, Beltsville, MD	ID	73
30. Vralstad, T., Biology, Univ. of Oslo, Oslo, Norway	D	10

Total cultures received from:

Internal (Univ. Alberta/UA Hospitals)	79
External (North America & International)	255

Total cultures received **334**

Codes: D - Deposit, ID - Identification

Table 2. Cultures Distributed in 2001

	Person or industry or culture collection and address	*Reason for shipment*	*Total*
1.	Berbee, M., Botany, Univ. British Columbia, Vancouver, BC	MB	5
2.	Bidochka, M.J., Biological Sciences, Brock Univ., St. Catherine, ON	B	14
3.	Bidwell, C., Environmental Recovery Group, San Francisco, CA	T	2
4.	BioPharm Inc., Laval, QC	M	4
5.	Blenis, P., (J. Parnuch) Renewable Resources, Univ. Alberta, Edmonton, AB	BD	16
6.	Brown, M.P., InterLink Biotech, Auburn, CA	M	1
7.	Buchanan, I. (K. Ikehata), Civil & Environmental. Engineering, Univ. Alberta	BR, EZ	14
8.	Centraalbureau voor Schimmelcultures (CBS), (R. Summerbell, G. de Hoog), Utrecht, The Netherlands	T, MB	11
9.	Chu, L., BJ Services, Tomball, TX	BD	5
10.	Currah, R. (M. Greif, B. Wilson), Biological Sciences, Univ. Alberta, Edmonton, AB	T, ME	15
11.	Dodson, W., Chesapeake, VA	T	1
12.	Egger, K.N., Biology, Univ. of Northern BC, Prince George, BC	MB	1
13.	Fundacao de Desenvolvimento da Pesquisa (FUNDEP), Campus da UFMG, Belo Horizonte, MG, Brazil	M	1
14.	GAP EnviroMicrobial Services Inc., London, ON	T	12
15.	GeneVision Inc., Laval, QC	T, MB	103
16.	Gill, W., Tasmanian Inst. of Agricultural Research, New Town, Tasmania, Australia	MR	2
17.	Gupta, A., Mediprobe Lab., Toronto, ON	ST	96
18.	Hambleton, S., ECORC, Agriculture & Agri-Food Canada, Ottawa, ON	T, MB	16
19.	Haugland, R., US Environmental Protection Agency, Cincinnati, Ohio	MB	9
20.	Keddie, A., Biological Sciences, Univ. Alberta, Edmonton AB	B	1
21.	Khasa, D. Renewable Resources, Univ. Alberta, Edmonton, AB	MB	7
22.	Kim, S.H., Wood Science, Univ. British Columbia, Vancouver, BC	BD	2
23.	Kozar, F., Prairie Biological Research, Edmonton, AB	FT	1
24.	Kredics, L., University of Szeged, Hungarian Academy of Science, Szeged, Hungary	T	5
25.	Lee, S., Wood Science, Univ. British Columbia, Vancouver, BC	T	3
26.	Malloch, D., Botany, Univ. of Toronto, Toronto, ON	B	2
27.	Monreal, M., Brandon Research Centre, Agric. & Agri-Food Canada, Brandon, MB	T, MB	3
28.	Okada, G., Japanese Collection of Microorganisms, Institute of Physical & Chemical Research (JCM, RIKEN), Wako Saitama, Japan	T	1
29.	Padhye, A.A., Emerging Pathogens , Centers for Disease Control (CDC), Atlanta, GA	TE	1
30.	Peterson, S., NRRL, USDA Agricultural Research Service, Peoria, IL	T, MB	16
31.	Philip, L., Biology, Okanagan University College, Kelowna, BC	M	1
32.	Pickard, M., Biological Sciences, Univ. Alberta, Edmonton, AB	BD, EZ	4
33.	Rennie, R., (C. Sand), National Centre for Mycotic Diseases, Univ. Alberta Hospital, Edmonton, AB	PH	6
34.	Rivera, T., Horticulture & Crop Science, Ohio State Univ., Wooster, OH	MR	5
35.	Schell, W., Medical Mycol. Res. Center, Duke University Medical Center, Durham, NC	MB	9
36.	Sonoki, S., Environmental Health, Azabu University, Sagamihara Kanagawa, Japan	BD	1
37.	Tokumasu, S., Sugadaira Montane Research Center, Univ. of Tsukuba, Nagano, Japan	T	7
38.	Truksa, L., Insultech Inc., Weston, ON	FRT	5
39.	Ulfig. K., Institute for Ecology of Industrial Areas, Katowice, Poland	T	1
40.	Untereiner, W., Botany, Brandon Univ., Brandon, MB	T	4
41.	Uzunovic, A., Forintek, Vancouver, BC	T	2
42.	Vega, F., Insect Control Lab., BARC, USDA-ARS, Beltsville, MD	T	1
43.	Wu, J., Ryerson Polytechnical Univ., Toronto, ON	M	2

Total cultures distributed to:

Internal (Univ. Alberta/UA Hospitals)	63
External (North America & International)	355
Total cultures distributed	**418**

Codes: B - Biocontrol, BD - Biodeterioration, BR – Bioremediation, EZ - Enzyme, FT – Fungus Resistance Testing, M - Metabolites, MB - Molecular biology, ME - Microbial Ecology; MR- Mycorrhizae, PH- Physiology, ST- Susceptibility Testing; T- Taxonomy, TE – Teaching