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 2005

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** (from Nov. 28)
Technical or laboratory assistants (trust): - **C. Gibbs** (to Sept 30), **A. Hashimoto, R. Gibas** (part-time to Jul 27), **V. Jajczay** (casual)
Volunteers- **M. Packer, S. Tchir**

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)

Graduate Supervision (Sigler)

Gibas, **Connie Fe C.** Ph.D. Biological Sciences, Supervisors L. Sigler & R. Currah, Biol. Sci.

- Defense Jan 24, 2005
- Thesis entitled "Systematics of the genus *Arachnomyces* having a predilection for the human nail" Ph.D. pp 1-94
- Post doctoral fellow Jun – Nov (co-supervised with R. Currah)

Graduate Supervisory Committees (Sigler)
A. Rice, Biological Sciences, Supervisor, R. Currah (defense 2005)
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)

Jun 3 Invited instructor, one day workshop on "DNA or the Classical Way" for US National Laboratory Training Network /Texas State Health Services, Atlanta, GA (with Dr. M. Brandt, Centers for Disease Control).

Individual Professional Training at UAMH

Jan 1 day course for 1 individual from QSV Biologics, Edmonton

Feb 4 day course for 2 individuals from Dept. of Medical Science, School of Veterinary Medicine; Univ. Wisconsin, from Dane County Humane Society, Madison, WI.

Cultures Received, Distributed and Accessioned

Cultures received for identification, deposit or in exchange (**Table 1**) **97**

Cultures distributed on request or in exchange (**Table 2**).....**179**

Culture Collection and Herbarium Accessions

New accessions **83**

Total accessions.....**10520**

Information on Accessions available through print and on-line CATALOGUES

Catalogue of the University of Alberta Microfungus Collection and Herbarium. 2005 [PDF] http://www.devonian.ualberta.ca/uamh/search

In-house and Collaborative Research

Refereed Journal Articles

1. Bertelsen MF*, Crawshaw GJ, Sigler L, Smith DA. 2005. Fatal cutaneous mycosis in tentacled snakes (*Erpeton tentaculatum*) caused by *Chrysosporium* anamorph of *Nannizziopsis vriesii*. Journal of Zoo & Wildlife Medicine 36:82-87.
   *Toronto Zoo, 361A Old Finch Avenue, Scarborough, Ontario, Canada M1B 5K7

   Abstract The fungus *Chrysosporium* anamorph of *Nannizziopsis vriesii* was identified as the cause of fatal, multifocal, heterophilic dermatitis in four freshwater aquatic captive-bred tentacled snakes (*Erpeton tentaculatum*). Pale, 1- to 4-mm focal lesions involving individual scales, occurred primarily on the head and dorsum. Histology showed multifocal coagulation necrosis of the epidermis, with marked heterophilic infiltration without involvement of the underlying dermis. Septate, irregularly branched hyphae, and clusters of 4- to 8- by 2- to 3-µm rod-shaped cells (arthroconidia) were present within the lesions and in a superficial crust. Failure to maintain an acidic environment was likely a predisposing factor in the development of these lesions.

2. Brandt ME*, Gaunt D, Iqbal N, McClinton S, Hambleton S, Sigler L. 2005. False-positive *Histoplasma capsulatum* Gen-Probe chemiluminescent test caused by a *Chrysosporium* species. Journal of Clinical Microbiology 43:1456-1458.

*Mycotic Diseases Branch, Division of Bacterial and Mycotic Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia.

Abstract We describe a case in which the *Histoplasma capsulatum* AccuProbe test displayed cross-reactivity with a respiratory isolate thought to be *Histoplasma* but not morphologically consistent with *H. capsulatum*. The isolate was later identified as the *Chrysosporium* anamorph of *Nannizziopsis vriesii* by sequence analysis and phenotypic data.

3. Hambleton S*, Sigler L. 2005. *Meliniomyces*, a new anamorph genus for root-associated fungi with phylogenetic affinities to *Rhizoscyphus ericae* (≡ *Hymenoscyphus ericae*), *Leotiomycetes.* Studies in Mycology 53:1-27.

*Biodiversity Theme (Mycology and Botany), Environmental Health Program, Agriculture and Agri-Food Canada, Eastern Cereal and Oilseed Research Centre, Ottawa, ON

Abstract Sterile fungi isolated from surface-sterilized roots of the *Ericaceae*, and hypothesized to be conspecific based primarily on restriction fragment length polymorphisms, were provisionally named as Variable White Taxon (VWT). In preliminary resynthesis trials with *Vaccinium myrtilloides* or *V. vitis-idaea*, isolates did not form typical ericoid mycorrhizas. Additional isolates obtained from roots of the *Orchidaceae*, *Pinaceae*, *Betulaceae* and *Salicaceae*, and given informal names such as Sterile white 1 (SW1), were thought to represent the same taxon based on cultural similarities. To evaluate conspecificity and infer phylogenetic affinities, partial nuclear ribosomal DNA sequences were determined. Parsimony analyses supported a species level distinction for VWT/SW1 and indicated that the fungus is placed within the species complex referred to as the "*Hymenoscyphus ericae* aggregate" which includes *H. ericae* (*Leotiomycetes*), many unnamed taxa and *Cadophora finlandica*. The new genus and species *Meliniomyces variabilis* is proposed to accommodate this root-associated fungus to facilitate discussion and information retrieval, and to provide a foundation for additional experimental work. Although isolates are sterile in culture, they can be identified by morphological characters in conjunction with ribosomal internal transcribed spacer (ITS) sequence data. The mycorrhizal status of *M. variabilis* is not yet clear. In prior published results, strains demonstrated no or some colonization with ericoid and ectomycorrhizal hosts but did not form true ectomycorrhizas. ITS analyses indicated that the "*H. ericae* aggregate" includes several other well-supported clades putatively named as *Meliniomyces* species. Representative strains were examined morphologically for two of these species, described as *M. vraolstadiae* and *M. bicolor*. Both include ectomycorrhizal mycobionts of the "*Piceirhiza bicoloratd*' morphotype. *Rhizoscyphus ericae* is accepted as the appropriate name for *H. ericae*.

4. Iwen PC*, Freifeld AG, Sigler L, Tarantolo,SR. 2005. Molecular identification of *Rhizomucor pusillus* as a cause of sinus-orbital zygomycosis in a patient with acute myelogenous leukemia. Journal of Clinical Microbiology 43:5819-5821.

*Department of Pathology and Microbiology, University of Nebraska Medical Center, Omaha, NB

Abstract Sinus-orbital zygomycosis caused by *Rhizomucor pusillus* in a patient with acute myelogenous leukemia is described. Identification was achieved by sequencing of the internal transcribed spacer (ITS) regions of the rRNA gene and by expression of zygospores in mating. This report highlights the value of ITS sequencing as a diagnostic tool for the identification of *R. pusillus* and expands the understanding of infection types caused by this zygomycete.

5. Pimentel JD*, Mahade van K, Woodgyer A, Sigler L, **Gibas C**, Harris OC, Lupino M, Athan E. 2005. Peritonitis due to *Curvularia inaequalis* in an elderly patient undergoing peritoneal dialysis and a review of six cases of peritonitis associated with other Curvularia spp. Journal of Clinical Microbiology 43: 4288–4292

*Department of Microbiology, Pathcare Consulting Pathologists, Barwon Health, Geelong, Australia,

Abstract Fungal peritonitis due to *Curvularia* species in patients undergoing peritoneal dialysis is a very rare problem. We report a case of peritonitis caused by *Curvularia inaequalis*. This is the first report in the English literature of this species causing human infection. We also review the six previously reported cases of continuous ambulatory peritoneal dialysis peritonitis caused by other *Curvularia* species.

6. Sigler L, Allan T, Lim SR, Berch S, Berbee M. 2005. Two new *Cryptosporiopsis* species from roots of ericaceous hosts. Studies in Mycology 53:53-62.

Abstract *Cryptosporiopsis* species are anamorphs of ascomycetes in the genera *Pezicula* and *Neofabraea* (*Dermataceae*).These fungi are occasionally isolated from roots of woody plants but may be difficult to identify due to absence of sporulation.Some isolates obtained from roots of ericaceous hosts had previously been linked phylogenetically to *Pezicula* and, when regrown, revealed conidiomata and conidia typical of *Cryptosporiopsis* species. Cultural and molecular data allowed for the ecognition of the new species, *Cryptosporiopsis ericae* and *C. brunnea*.

7. Sigler L , **Gibas CFC.** 2005. Utility of a cultural method for identification of the ericoid mycobiont *Oidiodendron maius* confirmed by ITS sequence analysis. Studies in Mycology 53:61-72.

Abstract A simple cultural method was investigated for its reliability in distinguishing the ericoid mycobiont *Oidiodendron* maius from selected other species of *Oidiodendron*. Forty three isolates were grouped by morphology after 28 d growth on cereal agar overlaid with a cellophane membrane. All isolates of *O. maius* and its close relative *O. citrinum* expressed characteristic colonial morphologies allowing recognition regardless of sporulation. Isolates grouped by colonial features correlated with strongly supported groupings obtained by analysis of nuclear ribosomal internal transcribed spacer (ITS) region sequences, including *O. maius* with *O. citrinum*, *O. griseum* with *O. flavum*, and *O. truncatum* as an independent group. Isolates of *O. tenuissimum*, including the ex-type of the purported synonym *O. fuscum*, demonstrated cultural variation and were dispersed among several different groups in the ITS analysis. *O. fuscum* is here regarded as a distinct taxon.

Refereed Articles In Press

8. Paré, JA., Coyle KA, Sigler L , Maas III AK, Mitchell RL. Pathogenicity of the *Chrysosporium* anamorph of *Nannizziopsis vriesii* for veiled chameleons (*Chamaeleo calyptratus*) Medical Mycology (acc May 2)

Book Chapters

9. Sigler L. 2005. Adiaspiromycosis and other infections caused by *Emmonsia* species. IN: Topley & Wilson's Microbiology and Microbial Infections Medical Mycology, 10 th ed., p 809-824. (Vol Eds. R. Hay and W. Merz) Arnold Hodder, London, U.K.

10. Paré JA, Sigler L. Fungal Diseases of Reptiles. In: Reptile Medicine and Surgery, 2nd ed. Chpt. 16. (Mader, D.R.) Saunders (in press; to appear Jan-06).

Presentations (‡invited speaker)

11. ‡ Sigler L. 2005. Phenotypic mycology has gone – or has it? Symposium Sequence-based identification of mycotic pathogens. 119/F. MMSA-American Society for Microbiology Ann. Mtg. Atlanta.
12. Hambleton S, Sigler L. 2005. Characterization of fungal root endophytes allied to the ericoid

mycobiont *Rhizoscyphus ericae* (= *Hymenoscyphus ericae*) and to the *Piceirhiza bicolorata* ectomycorrhizal morphotype. Plant Canada, Edmonton, H3.1

13. Sigler L, Gibbs C, **Gibas CFC**. 2005. The University of Alberta Microfungus Collection and Herbarium – a Canadian microbial resource centre conserving and supplying mycorrhizal and other fungi. Plant Canada, Edmonton, P211.
14. Sigler L, **Gibas CFC**. 2005. Utility of a cultural method for identification of the ericoid mycobiont *Oidiodendron maius* confirmed by ITS sequence analysis. Plant Canada, P218.
15. Sigler L, Allan T, Lim SR, Berch S , Berbee M. 2005. Two new *Cryptosporiopsis* species from roots of ericaceous hosts in western North America. Plant Canada, Edmonton, P210.
16. Paré, JA, Andes DR, Sigler L. 2005. In vitro suceptibility of fungal isolates from reptiles to antifungal drugs. Am. Assoc. Zoo Vet. Omaha, NB.
17. Wolf JC, William SR, Sigler L, Dykstra M, Wolfe MJ. 2005. Livid lesions in lumpfish (*Cyclopterus lumpus*) associated with a fungus *Exophiala pisciphila.* 30th Ann. Eastern Fish Health Workshop, Shepherdstown, West Virginia, Jun 13-17.
18. Sanche S, Wong A, Sigler L, Angel S, Peterson S. 2005. Invasive infection caused by a novel *Emmonsia* species in a renal transplant patient. Focus on Fungus Infections, Miami. Abstr 87.

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. Listed are some examples of individuals or agencies using these services in 2005.

- Warner, J.E., Crofter's Foods, isolates from water
- Haley, N., Veterinary Diagnostic Laboratory, Colorado State University, Fort Collins, CO, isolate causing pulmonary infection in a dog
- Jang, S. (M.M. Fry), Univ. California, Davis, an isolate causing osteomyelitis in a dog
- Kibsey, P., Victoria General Hospital, Microbiology & Laboratory Medicine, *Aspergillus terreus* from vitreous fluid of eye
- Shea, Y., National Institutes of Health, Bethesda, MD, isolate from soft tissue of patient with chronic granulomatous disease
- Sutton, D.A. (Rinaldi, M.), Fungus Testing Lab. Univ. Texas Health Science Center, San Antonio, TX, coelomyete isolate from joint fluid
- St. Germain, G., Laboratoire de Santé Publique du Quebec, St. Anne de Bellevue, PQ, isolates from human nail, leg wound and respiratory specimens
- Principe, L., Westcreek Farms, Langley, B.C., isolates from soil-less growth media
- Woodgyer, Microbiology & Immunology, Univ. Melbourne, Melbourne, Australia, isolates from human nails, bronchial washings, and corneas of three horses
- Yoder, J., Wittenberg University, Springfield, OH, isolates from brown dog ticks (Rhipicephalus sanguineus)

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 2005. Many of these isolates are referred to the NRC from provincial public health laboratories and hospital microbiology laboratories including the Ontario Ministry of Health Laboratory, Toronto; the BC Centres for Disease Control, Vancouver; St. Paul's Hospital, Vancouver, Saint John Regional Hospital, NB; Lethbridge Regional Hospital, Lethbridge, AB; Atlanta Veterinary College, Charlottetown, PEI, St. Michael's Hospital, Toronto, etc.

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 2005, about 26 reports were prepared on samples submitted from homes, commercial or public buildings in the western provinces.

Presentations, Visiting Scientists

May 31	Dr. K. Haselwandter, Dept. of Microbiology, Leopold Franzens Univ. of Innsbruck
Jun 6 -9	LS spoke in a symposium entitled "Sequence-based identification of mycotic pathogens at the American Society for Microbiology Annual Meetings in Atlanta, GA"
May – Oct	Dr. J. Herrera, Division of Science, Truman State University, Kirksville, MO came as a sabbatical visitor from May 14 to October 7. His objectives were to upgrade his knowledge and skills in identification of microfungi using traditional methods supplemented with molecular techniques.

Other Activities

Editorial work (LS): Journal of Clinical Microbiology (1) , Medical Mycology (2),. Mycoses (1), Antonie van Leeuwenhoek J. Microbiology & Serology (1), Emerging Infectious Disease (1); co-editor of Studies in Mycology volume 53 published by Centraalbureau voor Schimmelcultures

Committee work (LS)

- Member of the International Union of Biological Sciences (IUBS) World Federation of Culture Collections (WFCC) Committee on Postal, Quarantine and Safety Regulations, 1995- present
  A summary of the new regulations and our committee report were published in the WFCC Newsletter 40:February 2005
- Member, Mycological Society of America Committee on Culture Collections – This committee monitors and reports on activities affecting culture collections mainly in North America.

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. Systematics of Fungi in the Human Environment (2000-2005	29,000
NSERC. Major Facilities Access (2005-2008). The University of Alberta Microfungus Collection and Herbarium (UAMH).	52,767
U of A Small Faculties Fund. Software for DNA sequence editing and contig assembly and computer.	5,000
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. Antal Z, Kredics L, Pakarinen J, Doczi I, Andersson M, Salkinoja-Salonen M, Manczinger L, Szekeres A, Hatvani L, Vagvolgyi C, Nagy E. 2005. Comparative study of potential virulence factors in human pathogenic and saprophytic Trichoderma longibrachiatum strains. Acta Microbiologica et Immunologica Hungarica, 52 341–350 (2005)

   Abstract Potential virulence factors of 9 saprophytic and 12 clinical *Trichoderma longibrachiatum* strains were examined in the present study, in order to compare their capacity to cause infection in humans. All of the strains were able to grow at temperatures up to 40 °C and at pH values ranging from 2.0 to 9.0. Carbon and nitrogen source utilization experiments revealed that all of the strains were able to utilize a series of basic amino acids both as sole carbon and nitrogen sources. The MIC values of the tested antifungal drugs were found to be 0.016–8 μg/ml for amphotericin B, 64–256 μg/ml for fluconazole, 0.5–32 μg/ml for itraconazole and 0.008–1 μg/ml for ketoconazole in the case of the examinedis olates. Metabolites of the strains inhibited the growth of different bacteria, furthermore, compounds produced by three clinical isolates reduced the motility of boar spermatozoa, indicating their toxicity to mammalian cells as well. On the whole, there were no significant differences in the examined features between strains derived from clinical or soil samples. The question, however, whether all environmental *Trichoderma longibrachiatum* strains have the capacity to cause infections or not, remains still unanswered.

2. Aribandi M, Bazaon IC, Rinaldi MG. 2005. Magnetic resonance imaging findings in fatal primary cerebral infection due to Chaetomium strumarium. Australas Radiol 49:166-9

   Abstract This report describes MRI findings of a rare case of biopsy-proven fatal cerebral infection with Chaetomium strumarium in a 28-year-old man with a history of i.v. drug abuse. Magnetic resonance imaging revealed rapidly progressing lesions with irregular peripheral enhancement, possible central haemorrhage and significant mass effect. Only six cases of cerebral infection with Chaetomium have been reported in the English literature. This is the first report in the radiology literature describing the imaging findings. The previously reported cases of cerebral infection by the Chaetomium species are also reviewed.

3. Bois G, Bertrand A, Piche Y, Fung M, Khasa DP. 2005. Growth, compatible solute and salt accumulation of five mycorrhizal fungal species grown over a range of NaCl concentrations. Mycorrhiza. 28:1-11.

   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. Entz SC, Johnson DL, Kawchuk LM. 2005. Development of a PCR-based diagnostic assay for the specific detection of the entomopathogenic fungus *Metarhizium anisopliae* var. *acridum.* Mycological Research 109:1302-1312.

Abstract The entomopathogenic fungus *Metarhizium anisopliae* var. *acridum* is registered as a mycopesticide for acridid control in Africa and Australia. Traditionally, identification of *M. anisopliae* var. *acridum* infection in grasshoppers and locusts has relied upon development of fungal growth in infected cadavers. Conventional methods of detection of this entomopathogen in the environment and non-target organisms have been based on culture and bioassay. A PCR-based method for the detection of *M. anisopliae* var. *acridum* was developed. Sequence data from the distinct ITS rDNA regions facilitated the design of PCR primers that were used in PCR-based diagnostic assays for the detection of fungal DNA. The amplified sequence was 420 bp in length and specific to *M. anisopliae* var. *acridum*. Isolates of *M. anisopliae* var. *anisopliae* and *M. flavoviride* produced no PCR product with these primers. Other fungal entomopathogens, plant pathogens, mycopathogens, and soil saprophytes were also not detected by the pathogen-specific primers. The assay was also effective for the detection of *M. anisopliae* var. *acridum* DNA in the presence of soil DNA extracts and in infected grasshoppers.

5. Hambleton S, Nickerson NL, Seifert KA. 2005. Leohumicola, a new genus of heat-resistant hyphomycetes. Stud Mycol 53:29-52.

Abstract: The new anamorph genus Leohumicola (hyphomycetes) is described for four species, including three new species isolated after heat treatment of soils collected in Canada. The species produce slow-growing agar colonies that eventually produce lateral or terminal aleurioconidia, with a dark brown terminal cell, and the remains of a paler basal cell that fractures during secession. The genus is compared with Humicola, Trichocladium, Thermomyces, Complexipes and some other morphologically similar genera. Nuclear ribosomal small subunit (SSU) ribosomal DNA sequences demonstrate that Leohumicola is a monophyletic group in the Leotiomycetes, distinct from Humicola and Trichocladium (Sordariales), and Thermomyces (Eurotiales). Internal transcribed spacer sequences (ITS) support our recognition of four species of Leohumicola, each with distinct colony and micromorphological characters. The existence of additional species is probable based on our own ITS sequences and some retrieved from GenBank. The type species L. verrucosa, was recovered from a variety of soil types across Canada, and has sympodially proliferating conidiogenous cells that produce conidia with verrucose terminal cells that measure 4–5.5 x 4–5.5 μm. The SSU of some strains of this species have five long Group I introns that extend the length to more than 3700 nt. Leohumicola lenta produces very slowly growing colonies on agar media and larger conidia than L. verrucosa, and L. terminalis produces only terminal conidia. The latter two species are represented by single strains. The fourth species, L. minima is based on Trichocladium minimum, originally isolated from volcanic ash soil from Chile. Internal transcribed specer (ITS) sequences suggest that Humicola is a synonym of Trichocladium, a finding that may require conservation of Humicola. Dichotomous keys are provided to the accepted species of Leohumicola, and to morphologically similar aleurioconidial genera.

6. Hausner G, Reid J. 2004. The nuclear small subunit ribosomal genes of Sphaeronaemella helvellae, Sphaeronaemella fimicola, Gabarnaudia betae, and Cornuvesica falcata: phylogenetic implications. Canad J Botany 82:752-762.

   Abstract Sequences were obtained from the nuclear small subunit ribosomal RNA genes for representatives of four ophiostomatoid genera (Ceratocystis, Gondwanamyces, Cornuvesica, and Sphaeronaemella) to resolve their phylogenetic position within the Ascomycota. Phylogenetic analysis suggests that these genera are monophyletic and share common ancestry with members of the Microascales. Based on sequence data, strains representing the mitotic species Gabarnaudia betae (Delacr.) Samson & W. Gams were shown clearly to be derived from Sphaeronaemella species. Sequences were also obtained from strains representing the syntype of Sphaeronaemella fragariae, the exholotype of Sphaeronaemella humicola, and the extype of Gabarnaudia tholispora. The results suggest that putative extype cultures for S. humicola and G. tholispora no longer represent the original material deposited. Our data also support the exclusion of S. fragariae from Sphaeronaemella.

7. Ikehata K, Buchanan ID, Pickard MA, Smith DW. 2005. Purification, characterization and evaluation of extracellular peroxidase from two Coprinus species for aqueous phenol treatment. Bioresource Technol. 96:1758-70. Epub 2005 Mar 19.

   Abstract Non-ligninolytic fungal peroxidases produced by Coprinus cinereus UAMH 4103 and Coprinus sp. UAMH 10067 were purified, characterized and evaluated as cost-effective alternatives to horseradish peroxidase for aqueous phenol treatment. Purified Coprinus peroxidases exhibited a molecular weight of 36 kDa on matrix-assisted laser desorption ionization time-of-flight mass spectrometry. Although the catalytic properties of the two Coprinus peroxidases were nearly identical in both crude and purified forms, the stabilities were substantially different. The peroxidase from Coprinus sp. UAMH 10067 was more stable at 50 degrees C and under basic conditions (up to pH 10) than the enzyme from C. cinereus UAMH 4103. The former enzyme also performed better at pH 9 than the latter one in aqueous phenol treatment. The phenol removal efficiency of the Coprinus peroxidase was comparable to those of previously studied plant peroxidases. The broader working pH and higher thermal and alkaline stability of the peroxidase from Coprinus sp. UAMH 10067 may be advantageous for its application to industrial wastewater treatment.

8. Ikehata K, Pickard MA, Buchanan ID, Smith DW. 2004. Optimization of extracellular fungal peroxidase production by 2 Coprinus species. Can J Microbiol. 50(12):1033-40.

   Abstract Optimum culture conditions for the batch production of extracellular peroxidase by Coprinus cinereus UAMH 4103 and Coprinus sp. UAMH 10067 were explored using 2 statistical experimental designs, including 2-level, 7-factor fractional factorial design and 2-factor central composite design. Of the 7 factors examined in the screening study, the concentrations of carbon (glucose) and nitrogen (peptone or casitone) sources showed significant effects on the peroxidase production by Coprinus sp. UAMH 10067. The optimum glucose and peptone concentrations were determined as 2.7% and 0.8% for Coprinus sp. UAMH 10067, and 2.9% and 1.4% for C. cinereus UAMH 4103, respectively. Under the optimized culture condition the maximum peroxidase activity achieved in this study was 34.5 U x mL(-1) for Coprinus sp. UAMH 10067 and 68.0 U x mL(-1) for C. cinereus UAMH 4103, more than 2-fold higher than the results of previous studies.

9. Kredics L, Antal Z, Szekeres A, Manczinger L, Doczi I, Kevei F, Nagi E. 2004. Production of extracellular proteases by human pathogenic Trichoderma longibrachiatum strains. Acta

Microbiologica et Immunologica Hungarica 51:283-295

Species belonging to the filamentous fungal genus Trichoderma are well known as potential candidates for the biological control of plant pathogenic fungi and as cellulase producers of biotechnological importance. Several data were published in the last decade also about the clinical importance of this genus, indicating that Trichoderma strains may be potential opportunistic pathogens in immunocompromised patients. However, there is a lack of information about the potential virulence factors of clinical Trichoderma strains. This study was designed to examine the extracellular proteolytic enzymes of six clinical T. longibrachiatum isolates (strains **UAMH** 7955 from acute invasive sinusitis of a liver and small bowel transplant recipient, **UAMH** 7956 from lung, liver and intestinal wall of a bone marrow transplant recipient, **UAMH** 9515 from the peritoneal effluent of a female, ATCC 201044 from a skin lesion of a paediatric patient with aplastic anaemia, and ATCC 208859 from an HIV-positive patient). Supernatants from induced liquid cultures of the examined strains were screened for proteolytic enzyme activities with 11 different chromogenic p-nitroaniline substrates. The production of trypsin-like, chymotrypsin-like and chymoelastase-like protease activities cleaving N-Benzoyl-L-Phe-L-Val-L-Arg-p-nitroanilide, N-Succinyl-L-Ala-L-Ala-L-Pro-L-Phe-p-nitroanilide, and N-Succinyl-L-Ala-L-Ala-L-Pro-L-Leu-p-nitroanilide, respectively, was common among the strains examined. Separation of trypsin- and chymotrypsin-like activities by column chromatography revealed, that both systems are complex consisting of several isoenzymes. The pH-dependence of these two protease systems was also studied. Based on the results, the different isoenzymes seem to have different optimal pH values. Extracellular proteolytic enzymes may be involved in the pathogenicity of Trichoderma strains as facultative human pathogens

10. Meklin T, Haugland RA, Reponen T, Varma M, Lummus Z, Bernstein D, Wymer LJ, Vesper SJ. 2004. Quantitative PCR analysis of house dust can reveal abnormal mold conditions. J. Environ Monit 6:615-620.

    Abstract Indoor mold concentrations were measured in the dust of moldy homes (MH) and reference homes (RH) by quantitative PCR (QPCR) assays for 82 species or related groups of species (assay groups). About 70% of the species and groups were never or only rarely detected. The ratios (MH geometric mean : RH geometric mean) for 6 commonly detected species (Aspergillus ochraceus, A. penicillioides, A. unguis, A. versicolor, Eurotium group, and Cladosporium sphaerospermum) were w1 (Group I). Logistic regression analysis of the sum of the logs of the concentrations of Group I species resulted in a 95% probability for separating MH from RH. These results suggest that it may be possible to evaluate whether a home has an abnormal mold condition by quantifying a limited number of mold species in a dust sample. Also, four common species of Aspergillus were quantified by standard culturing procedures and their concentrations compared to QPCR results. Culturing underestimated the concentrations of these four species by 2 to 3 orders of magnitude compared to QPCR.

11. Meysami P, Baheri H. 2003. Pre-screening of fungi and bulking agents for contaminated soil bioremediation. Advances in Environmental Research 7:881-887

    Abstract This paper discusses methods to promote fungal growth and penetration in a soil contaminated with weathered crude oil. The ligninolytic enzyme activity and toxicity threshold of several white-rot fungi known for their hydrocarbon degradation ability was studied. Pine wood chips, peat moss and Kellogg's Bran Flakes were examined for their properties as the bulking agents and solid amendments. The results showed all strains developed severe toxicity at concentrations higher than 10 000 ppm. Two strains of Bjerkandera adusta **UAMH** 7308 and 8258 showed the highest ligninolytic enzyme activity. Furthermore, white-rot fungi did not colonize the soil without bulking agents being present in the soil. A mixture of peat moss with

bran flakes resulted in the best growth, penetration and enzyme activity in the soil.

12. Mostert L, Groenewald JZ, Summerbell RC, Robert V, Sutton DA, Padhye AA, Crous PW. 2005. Species of Phaeoacremonium associated with infections in humans and environmental reservoirs in infected woody plants. J Clin Microbiol 43(4):1752-67

    Abstract To date, three species of Phaeoacremonium have been associated with phaeohyphomycosis. These are P. parasiticum (formerly Phialophora parasitica), P. inflatipes, and P. rubrigenum. Numerous unknown isolates resembling Phaeoacremonium spp. have in recent years been isolated from human patients as well as from woody plants that appear to be the main environmental source of these fungi. Nine new Phaeoacremonium species, of which six were obtained as etiologic agents of human opportunistic infection, are reported. They can be identified based on their cultural and morphological characters, and the identifications are strongly supported in phylogenetic analyses of partial sequences of the actin, beta-tubulin, and calmodulin genes. A multiple-entry electronic key based on morphological, cultural, and beta-tubulin sequence data was developed to facilitate routine species identification. Reexamination of all isolates of P. inflatipes associated with human disease showed them to be misidentified and to belong to the new taxa described here.

13. Rice, AV, Currah, RS. 2005. Profiles from Biolog FF plates and morphological characteristics support the recognition of *Oidiodendron fimicola* sp. nov. Stud Mycol 53:75–82.

    Abstract *Oidiodendron fimicola* sp. nov., represented by two collections from mushroom compost, is distinct from other species in the genus in having scaly conidiophores and asperulate, hyaline to melanized, barrel-shaped to irregular conidia. By light microscopy, it most closely resembles *Oidiodendron flavum*; by scanning electron microscopy the two species can be clearly distinguished based on perispore morphology and on the formation of distinctive scale-like protrusions on conidiophores of *O. fimicola*. We were unable to obtain DNA from *O. fimicola* despite repeated attempts. As a result, we investigated the use of Biolog profiles as a source of taxonomic characters for delimiting the new species among a selection of related taxa. Biolog FF profiles for 42 isolates, representing 19 species of *Oidiodendron* and *Myxotrichum*, were analysed using cluster analyses in PC-ORD. Because the reliability of Biolog FF kits with *Oidiodendron* species has not previously been assayed, multiple replicate tests were done for some isolates. Each of the resulting 54 data sets was unique; that is to say, variation occurred among isolates of the same species and in replicate trials of individual isolates, in addition to being seen in connection with differences among species. Despite this degree of test variability, it was possible to reliably distinguish *O. fimicola*, *O. rhodogenum*, *O. truncatum*, and most isolates of *O. maius* and *O. periconioides* with Biolog FF profiles. Four isolates of an as yet undescribed species of *Oidiodendron* also gave consistent profiles supporting theirconspecificity.

14. Rice AV, Currah RS. 2005. *Oidiodendron*: A survey of the named species and related anamorphs of *Myxotrichum* Stud Mycol 53:83–120.

    Abstract: Synoptic and dichotomous keys to 23 species of *Oidiodendron* and similar arthroconidial anamorphs of *Myxotrichum* were developed using morphological and physiological characters. Illustrations and brief descriptions based on living isolates and published descriptions are provided for all species treated. Included are the unnamed *Oidiodendron* states of *Myxotrichum arcticum*, *M. cancellatum*, *M. emodense*, *M. setosum*, and *M. striatosporum*, as well as the anamorphic species *O. ambiguum*, *O. cerealis*, *O. chlamydosporicum* (inclusive of *O. scytaloides* as a synonym), *O. echinulatum*, *O. fi micola*, *O. fl avum*, *O. fuscum*, *O. griseum*, *O. hughesii* (inclusive of *O. reticulatum* as a synonym), *O. maius* (inclusive of *O. maius*

var. *citrinum* and *O. maius* var. *maius*), *O. muniellense*, *O. myxotrichoides*, *O. periconioides*, *O. pilicola*, *O. rhodogenum*, *O. setiferum* (inclusive of *O. ramosum* as a synonym), *O. tenuissimum*, and *O. truncatum*. *Oidiodendron fuscum*, the original type species, is recognized as distinct. *Oidiodendron robustum* is excluded because of its large conidia and conidiophores and because the original drawings do not convincingly portray arthroconidia. *Oidiodendron terrestre* is excluded because its large, two-celled conidia, rapid growth, and hyaline conidiophores are inconsistent with the generic diagnosis and because the mode of its conidiogenesis is unclear from the original descriptions and illustrations.

15. Schulz MJ, Thormann MN. 2005. Functional and taxonomic diversity of saprobic filamentous fungi from Typha latifolia from Central Alberta, Canada. Wetlands 25:675-684

Abstract The fate of vascular plant detritus and the microbial communities and processes involved during the decomposition of litter are important aspects in elucidating energy flow and nutrient cycling in wetlands. Therefore, we collected and identified conspicuous fungal sporocarps in situ and isolated microfungi from living and dead Typha latifolia (cattail) leaf tissues. Cattail is a dominant plant species in southern boreal and temperate marshes and abundant in the Low Boreal Mixedwood ecoregion in central Alberta, Canada. Following two successive field collections in early and late summer 2001, 45 different fungal taxa were identified. There were 26 ascomycetes, five basidiomycetes, and 14 anamorphic taxa, most of them with putative ascomycetous affinities. Twenty-four taxa represented new records for T. latifolia, 12 were new to Canada, and seven were new to North America. Also, five taxa were new reports outside of the country of the type locality. To elucidate their roles in the decomposition of T. latifolia leaves, we examined 33 taxa for their ability to use cellulose, gelatin, starch, tannic acid, and lignin as carbon sources (based on calorimetric tests), as well as to cause mass losses of sterile T. latifolia leaves. The number of fungi using cellulose and gelatin as carbon sources was significantly greater than those using starch, tannic acid, or lignin. Mass losses of T. latifolia leaf tissues by ascomycetes and basidiomycetes ranged from 1.3 to 54.6% and –0.4 to 52.1%, respectively. There was a positive relationship between mass loss of T. latifolia leaves and cellulose degradation but not between mass loss and any of the other carbon sources. Our data showed that a taxonomically diverse suite of fungi effectively degrades this plant material; however, additional studies examining the decomposer communities of other dominant wetland plants are necessary to gain a better understanding of nutrient and energy dynamics in wetlands at the ecosystem level.

16. Summerbell RC. 2005. Root endophyte and mycorrhizosphere fungi of black spruce, *Picea mariana*, in a boreal forest habitat: influence of site factors on fungal distributions. Stud Mycol 53: 121–145.

Abstract: In a study of fungi growing in various root-associated habitats in and around *Picea mariana*, black spruce, in northern Ontario, Canada, an examination was made of the degree to which differences in growth sites within an area of a few square kilometers might influence the structure of root-associated filamentous microfungal populations. *Picea mariana* roots were collected at four strongly differing boreal forest sites: an undisturbed forest site with deep litter and humus layers; a recently regenerated forest; a clearcut, former portable sawmill site with a few small, naturally regenerated trees; and an open peat bog penetrated by roots from trees growing along the margin. Comparisons were done on isolate assemblages primarily from serially washed mycorrhizae, supplemented with comparison samples from washed root bark and adherent rhizosphere soil. The Bray & Curtis similarity index and nodal components analysis were utilised to identify trends within the data. Root endophyte fungi, mainly *Phialocephala fortinii* and *Meliniomyces variabilis*, were among the most common isolates from serially washed

mycorrhizae and showed strong trends among the site types, with the former most common from sites low in humus and also low in known humus-associated microfungi, and the latter most common from the peat bog site. The overall composition of the isolate assemblages from washed mycorrhizae mainly reflected site factors, with assemblages from the undisturbed and regenerated forest sites similar to one another and those from the clearcut and peat bog sites strongly distinct. A major difference was also seen between two seasonal samples at the exposed clearcut site, but few seasonal differences were seen at the other sites. The regenerated and undisturbed forest sites were high in *Umbelopsis isabellina*, *Mortierella verticillata* and *Penicillium spinulosum*, fungi typical of humic horizons in boreal podzols; the clearcut yielded the greatest numbers of *Fusarium proliferatum*, *Umbelopsis nana* and *Penicillium montanense* isolates, an assemblage tending to indicate exposed mineral soil; while the peat bog was typified by the presence of characteristic northern peat inhabitants *Mortierella pulchella* and *P. spinulosum*, as well as temperate peat inhabitant *Penicillium lividum*. A synthesis of these results with other data suggests that as a microhabitat, the mycorrhizosphere, as originally defined by Foster & Marks, is of little significance in determining the structure of filamentous fungal populations in soil influenced by the presence of ectomycorrhizal forest tree roots. Edaphic and overall microbial community conditions are much more significant, but the influence of a "symbiorhizosphere effect" exerted by certain ectomycorrhizal symbionts within the whole soil volume they occupy is also known in some cases and worthy of further investigation.

17. Sutton DA, Thompson EH, Rinaldi MG, Iwen PC, Nakasone KK, Jung HS, Rosenblatt HM, Paul ME. 2005. Identification and first report of Inonotus (Phellinus) tropicalis as an etiologic agent in a patient with chronic granulomatous disease. J Clin Microbiol 43:982-7.

    Abstract Although isolates of filamentous basidiomycetes can usually be recognized in a clinical laboratory setting, identification is problematic, as they seldom exhibit diagnostic morphological features formed in nature. This paper is the first report of Inonotus (Phellinus) tropicalis inciting human disease and describes the methods used to support the identification.

18. Tsuneda A, Currah RS. 2004. Knufia endospora, a new dematiaceious hyphomycete from trembling aspen. Rep. Tottori Mycol. Inst. 42:1-9.

    Abstract Knufia endospora sp. nov. was isolated from the bark of Populus tremuloides in Alberta, Canada. It resembles the type species of the genus, K. crypophialidica, in producing slow-growing, black colonies and thallic-arthric and blastic conidia, but differs in lacking phialides and forming subglobose to cylindrical endoconidia in undifferentiated, terminal and intercalary hyphal cells as well as in darkly pigmented, multicellular bodies.

19. Vazquez G, Tinoco R, Picard MA, Vazquez-Duhult R. 2005.Transformation of halogenated pesticides by versatile peroxidase from Bjerkandera adusta.Enzyme and Microbioal Technology. 36: 223-231

    Abstract Purified versatile peroxidase (VP) from the white rot fungus Bjerkandera adusta **UAMH 8258** was used to study the transformation of several pesticides, including some as highly halogenated as the wood preservative pentachlorophenol (PCP). From the 13 pesticides assayed, dichlorophen, bromoxynil and PCP were transformed by VP in the presence and in the absence of manganese(II). For all the pesticides transformed, the activity was higher in the absence of Mn(II) at pH 3 than in the presence of Mn(II) at pH 4. Catalytic constants (kcat) in the absence of Mn(II) at pH 4 were 194 and 409 min-1 for dichlorophen and bromoxynil, respectively. The KM values were 32 and 31 micro M for the pesticides and 26 and 19 micro M

for the hydrogen peroxide, respectively. Analysis of reaction products by GC-MS showed the presence of 2,3,5,6-tetrachloroquinone among the products from pentachlorophenol oxidation, while the main product from dichlorophen was 4-chlorophenol-2,2'-methylenequinone. Several polymers were obtained from the peroxidase oxidation of bromoxynil. In all cases, we found dehalogenation reactions mediated by the versatile peroxidase. The importance and potential uses of the enzymatic transformation of these halogenated toxic compounds is discussed.

20. Xi L, Fukushima K, Lu C, Takizawa K, Liao R, Nishimura K. 2004. First case of Arthrographis kalrae ethmoid sinusitis and ophthalmitis in the People's Republic of China. J Clin Microbiol 42:4828-4831.

Abstract We present here the first case in the People's Republic of China of human disease caused by the fungus Arthrographis kalrae. The male patient had fungal panophthalmitis and invasive sinusitis involving the maxillary and ethmoid sinuses. He was an apparently healthy man before receiving trauma to his left eye. He complained of pain and loss of visual acuity in the injured eye, which displayed redness and edema and eventually discharged pus. His symptoms became more severe after he was treated with steroids and several antibacterial agents. A computed tomography scan of the left eye revealed that the maxillary and ethmoid sinuses were involved. A smear of purulent material from the left eye orbit revealed fungal elements, and cultures of the material grew a fungus. The isolate was identified as A. kalrae based on gross and microscopic morphologies, biochemical assays, and DNA sequence analysis. The patient received amphotericin B intravenously, itraconazole orally, and atomized allitridum by nebulizing allitridum therapy. The patient's wound healed following surgical intervention, but the patient lost the use of his left eye. This case should remind ophthalmologists and other clinicians to consider the possibility of infections being fungal when antibacterial agents have no effect and the patient's condition worsens.

21. Zettler LS, Piskin KA, Stewart SL, Hartsock JJ, Bowles ML, Bell TJ. 2005. Protocorm mycobionts of the Federally threatened eastern prairie fringed orchid, *Platanthera leucophaea* (Nutt.) Lindley, and a technique to prompt leaf elongation in seedlings. Stud Mycol 53:163-171.

Abstract: A yet unresolved question in orchid biology is whether mycorrhizal fungi (= mycobionts) utilized as a carbon source by young seedlings (= protocorms) are different from those utilized by adult plants. This is the first report documenting the protocorm mycobionts of the Federally threatened eastern prairie fringed orchid, *Platanthera leucophaea*, and the first report describing a technique to culture mycotrophic seedlings to the green leaf stage. Seeds of *P. leucophaea* placed in retrievable nylon mesh packets were sown at Hildy Prairie (Grundy Co.), Illinois in November, 2000 and recovered in August, 2002. All resulting protocorms yielded mycobionts assignable to *Ceratorhiza goodyerae-repentis* (Costantin & Dufour) Moore - the same anamorphic fungus recovered from mature *P. leucophaea* plants in previous studies. Protocorms cultivated *in vitro* with a *Ceratorhiza* mycobiont were placed on a substrate of sand, activated charcoal, and modified oats medium and subjected to chilling (6 °C) in darkness, followed by exposure to a 12 h photoperiod (L : D, 12 h : 12 h) at 24 °C. Leaf length accelerated after the second week of incubation in light. Green leaf color became evident during the photoperiod implying that seedlings were capable of photosynthesis. Seedlings also maintained a mycotrophic capability evidenced by the presence of fungal pelotons in root-like organs. This study has significant merit for conservation by providing a protocol for *P. leucophaed*s cultivation, and by underscoring the importance of *C. goodyerae-repentis* in the prairie ecosystem.

Table 1. Cultures Received in 2005

Person or industry or culture collection and address	Purpose	Total
1. Berbee, M. , Dept. of Botany, Univ British Columbia, Vancouver, BC	D	3
2. Brezden, S., Agricultural Food and Nutritional Sci., Univ Alberta Edmonton, AB	R	1
3. Centraalbureau voor Schimmelcultures, Snippe-Claus, F. B., Utrecht, Netherlands	D	6
4. Currah, R. (Rice, A., Skinner, S.), Dept. of Biol., Sci., Univ Alberta, Edmonton, AB	D, ID	3
5. Friesen, D., Cameo Corp, Saskatoon, SK	ID	2
6. Haley, N., Veterinary Diagnostic Lab, Colorado State University, Fort Collins, CO	ID	1
7. Kaminsky, S., Dept. of Biol., U of Saskatchewan, Saskatoon, SK	ID/D	1
8. Kibsey, P., Dept. of Laboratory Medicine, Victoria Hospital, Victoria, BC	ID	1
9. Nakagiri, A., Nat'l Inst. of Tech. and Evaluation, Biological Resource Center, Chiba, Japan	EX	1
10. Rennie, R. (C. Sand), National Center for Mycotic Diseases, Univ Alberta Hospital, Edmonton, AB	ID	36
11. St. Germain, G., Laboratoire de Santé Publique, Saint Anne de-Bellevue, PQ	ID	4
12. Sutton, D., University of Texas Health Science Center, Univ Texas, San Antonio, TX	ID, D	3
13. Tsuneda, A., Dept. of Biol., Sci., Univ Alberta Edmonton, AB, Canada	D	3
14. Warner, J., Quality Control and Regulating Affairs, Crofter's Food Ltd., Parry Sound, ON	ID	2
15. West Creek Farms, L. Principe, Fort Langley, B.C.	ID	5
16. Winder, R., Pacific Forestry Center, Victoria, BC	D	12
17. Woodgyer, A., Microbiological Diagnostic Unit, Univ Melbourne, Melbourne, Australia	ID	5
18. Yoder, J., Wittenberg University, Springfield, OH	ID	2
19. Zettler, L., Dept. of Biol., Illinois College, Jacksonville, IL	D	6

Total cultures received from:

Internal (Univ Alberta/UA Hospitals) **43**

External (North America, International) **54**

Total cultures received 97

Codes: **D**= Deposit; **EX**= Exchange; **ID**= Identification, **R**= Requested

Table 2. Cultures Distributed in 2005

Person or industry or culture collection and address	Purpose	Total
1. Apotex Fermentation Inc., (Davies, S.), Winnipeg, MB	M	16
2. Berbee, M.(Dinh, D.), Dept. of Botany, Univ. British Columbia, Vancouver, BC	TE	1
3. Bills, G., Merck Sharp & Dohme de Espana, SA, Madrid, Spain	MB	5
4. Blenis, P., Renewable Resources, Univ Alberta, Edmonton, AB	BD	2
5. Canadian Collection of Fungus Cultures, (Babcock, C.,) Ottawa, ON	D	2
6. Caprioglio, H.M., Dept. of Biology, Colorado State University, Pueblo, CO	IAQ	1
7. Centraalbureau voor Schimmelcultures, Utrecht, Netherlands	EX	2
8. Chancy, M., The Mushroom Patch, Chatham, ON	E	2
9. Currah, R.S. (Plishka, M., Rice, A.), Biol. Sci., Univ Alberta, Edmonton, AB	TE, T	6
10. Cusack, F., Dept. of Biol. Sci., Univ Calgary, Calgary, AB	TE, PP	4
11. Florian, M.L., Simcoe Street, Victoria, BC	BD	2
12. Foos, K.M., Indiana University-East Richmond, IN	T	4
13. Garcia , F., Lab de Sanitat Vegetal, Dept. Agricultura, Barcelona, Spain	PP	1
14. Gimble, F., Inst of Biosci & Techno TAMUSHSC Center for Genome Research, Houston, TX	MB	1
15. Guo, X.W., Chinese Academy of Sciences, Beijing, China	MR	2
16. Isotechnika Inc., (Freitag, D.), Edmonton, AB	M	6
17. Iwen, P., Dept. of Pathol. & Microbiol., Univ Nebraska Medical Center, Omaha, NB	CR	2
18. Joanisse, G., Ecologie des Sols, Depa. de Biologie, Universite Sherbrooke, Sherbrooke, PQ	MR	12
19. Jones, M., Biology, Okanagan University College, Kelowna, BC	MR	2
20. Kenmoku, H., Riken Yokohama Institute, Yokohama, Japan	M	1
21. Kostyniuk, M., Alberta Research Council, Vegreville, AB		3
22. Kraus, G.F., Univ. Nat. Resources & Applied Life Sci., Vienna, Austria	IAQ	1
23. Kuga, Y., Soil Biol., Lab, Dept. of Food Prod Sci., Shinshu Univ. Nagano, Japan	MR	4
24. Marchand, G. (Laviolette, G.), Inst de Recherch Robert Sauvée, Montreal, PQ	BD	11
25. MBEC Bioproducts Inc., (Middlemiss, L.,) Edmonton, AB	ST	3
26. McInerney, N., Biology Lab, Red Deer College, Red Deer, AB	TE	2
27. Microbac Laboratories, (Brooks, R.), Maryville, IN	MB	1
28. Microbiologics Inc., (Corrigan, J.,) St. Cloud, MN	IAQ	7
29. Mikes, B., Univ Northern British Columbia, Prince George, BC	MR	1
30. Miller, J.D., Chemistry Dept., Carleton Univ., Ottawa, ON	M	1
31. Neiswanger, W. (Deal,B.), Merlo Station High School, Beaverton, OR	TE	2
32. Peterson, L., Botany, Univ. Guelph, Guelph, ON	MR	3
33. Peterson, S., Microbial Properties Res, National Center for Agric. Util. Res., Peoria, IL	CR	19
34. Pickard, M.A., Dept. of Biol., Sci., Univ Alberta, Edmonton, AB	EZ	1
35. Pyrri, I., Dept. of Biology, Univ. Athens, Athens, Greece	T	1
36. QSV Biologics, Edmonton, AB	QC	10
37. Rivera, C., University of Puerto Rico, Puerto Rico	TE	10
38. Schneider, K., Land Resource Science, Univ Guelph, Guelph, ON	BD	1
39. Simard, S. (Barker, J.), Forest Science, Univ. British Columbia, Vancouver, BC	MR	5
40. Sporometrics Inc., (Warnock, M.), Toronto, ON	IAQ	3
41. Symbiotech Tech Research Inc., (Quoreshi, A.M.), Edmonton, AB	MR	1
42. Thormann, M., Northern Forestry Centre, Edmonton, AB	PP	5
43. Thorn, G., Biology, Univ Western Ontario, London, ON	MB	2
44. Untereiner, W., Botany Dept., Brandon Univ., Brandon, MB	MB	5
45. Vanderwel, W. , Biology Dept., Kings Univ. College, Edmonton, AB	ST	2
46. Vujanovic, V., Universite de Montreal, Inst. Rech. Biologie Vegetale, Montreal, PQ	PP	1
Cultures distributed to:		
Internal (Univ Alberta)	9	
North America	143	
International	36	
Total cultures distributed	**179**	

Codes: BD - Biodeterioration, CR – Collaborative Research, D- Deposit, E –Edible; EX – Exchange, EZ - Enzyme, IAQ - Indoor Air Quality; M – Metabolites; MB – Molecular Biology; MR – Mycorrhizae, PP- Plant Pathology, QC- Quality Control, ST - Susceptibility Testing; T - Taxonomy, TE – Teaching