News from the mycology laboratory

Routine, reference, research

Malcolm Richardson
HUSLAB, Helsinki University
Central Hospital, and
University of Helsinki, Finland.

MYCOLOGICAL RESEARCH 111 (2007) 509–547

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journal homepage: www.elsevier.com/locate/mycres

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A higher-level phylogenetic classification of the *Fungi*

David S. HIBBETT[a,*], Manfred BINDER[a], Joseph F. BISCHOFF[b], Meredith BLACKWELL[c], Paul F. CANNON[d], Ove E. ERIKSSON[e], Sabine HUHNDORF[f], Timothy JAMES[g], Paul M. KIRK[d], Robert LÜCKING[f], H. THORSTEN LUMBSCH[f], François LUTZONI[g], P. Brandon MATHENY[a], David J. MCLAUGHLIN[h], Martha J. POWELL[i], Scott REDHEAD[j], Conrad L. SCHOCH[k], Joseph W. SPATAFORA[k], Joost A. STALPERS[l], Rytas VILGALYS[g], M. Catherine AIME[m], André APTROOT[n], Robert BAUER[o], Dominik BEGEROW[p], Gerald L. BENNY[q], Lisa A. CASTLEBURY[m], Pedro W. CROUS[l], Yu-Cheng DAI[r], Walter GAMS[l], David M. GEISER[s], Gareth W. GRIFFITH[t], Cécile GUEIDAN[g], David L. HAWKSWORTH[u], Geir HESTMARK[v], Kentaro HOSAKA[w], Richard A. HUMBER[x], Kevin D. HYDE[y], Joseph E. IRONSIDE[t], Urmas KÕLJALG[z], Cletus P. KURTZMAN[aa], Karl-Henrik LARSSON[ab], Robert LICHTWARDT[ac], Joyce LONGCORE[ad], Jolanta MIĄDLIKOWSKA[g], Andrew MILLER[ae], Jean-Marc MONCALVO[af], Sharon MOZLEY-STANDRIDGE[ag], Franz OBERWINKLER[o], Erast PARMASTO[ah], Valérie REEB[g], Jack D. ROGERS[ai], Claude ROUX[aj], Leif RYVARDEN[ak], José Paulo SAMPAIO[al], Arthur SCHÜßLER[am], Junta SUGIYAMA[an], R. Greg THORN[ao], Leif TIBELL[ap], Wendy A. UNTEREINER[aq], Christopher WALKER[ar], Zheng WANG[a], Alex WEIR[as], Michael WEISS[o], Merlin M. WHITE[at], Katarina WINKA[e], Yi-Jian YAO[au], Ning ZHANG[av]

MYCOLOGICAL RESEARCH 111 (2007) 1169–1183

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British Mycological Society promoting fungal science

journal homepage: www.elsevier.com/locate/mycres

Mycological Research

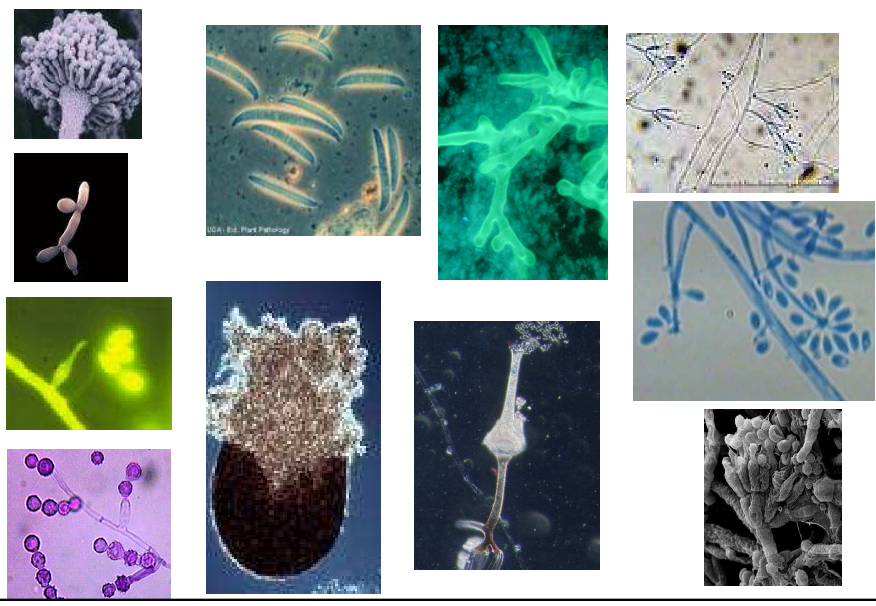
Revision of the genus *Absidia* (*Mucorales*, *Zygomycetes*) based on physiological, phylogenetic, and morphological characters; thermotolerant *Absidia* spp. form a coherent group, *Mycocladiaceae* fam. nov.

Kerstin HOFFMANN[a], *Sabrina DISCHER*[a,b], *Kerstin VOIGT*[a,*]

[a]*Institute of Microbiology, Fungal Reference Centre at the Department of Microbiology & Microbial Genetics, Friedrich Schiller University Jena, Neugasse 24, D-07743 Jena, Germany*
[b]*Max Planck Institute for Chemical Ecology, Department of Bioorganic Chemistry, Friedrich Schiller University Jena, Hans-Knöll-Straße 8, D-07745 Jena, Germany*

- Mesophilic *Absidia* species
- Thermotolerant species: *Myocladus*
  - *M. corymbifera*
  - *M. blakesleeanus*
  - *M. hyalospora*

Changing epidemiology



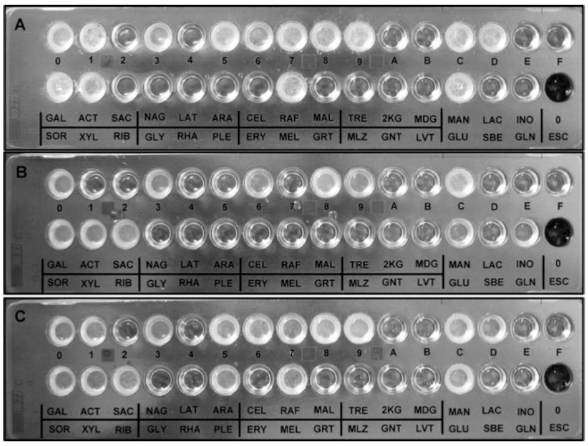
JOURNAL OF CLINICAL MICROBIOLOGY, May 2007, p. 1433–1439
0095-1137/07/$08.00+0 doi:10.1128/JCM.02219-06

Vol. 45, No. 5

Carbon Assimilation Profiles as a Tool for Identification of Zygomycetes▽

Patrick Schwarz,[1] Olivier Lortholary,[1,2] Françoise Dromer,[1] and Eric Dannaoui[1,3]*

Centre National de Référence Mycologie et Antifongiques, Unité de Mycologie Moléculaire, CNRS URA3012, Institut Pasteur, 75724 Paris Cedex 15, France[1]; Université Paris Descartes, Faculté de Médecine, AP-HP, Hôpital Necker-Enfants-Malades, Service des Maladies Infectieuses et Tropicales, 75743 Paris Cedex 15, France[2]; and Université Paris Descartes, Faculté de Médecine, AP-HP, Hôpital Européen Georges Pompidou, Unité de Parasitologie-Mycologie, 75015 Paris, France[3]



A. corymbifera

R. microsporus

S. racemosum

Changing epidemiology Yeasts and moulds

- Yeasts
  - non-*albicans*
  - non-*Candida*
  - shifts in resistance
- Moulds
  - non-*fumigatus*
  - other agents of hyalohyphomycosis
  - agents of zygomycosis

ARCHIVES OF ORAL BIOLOGY 54 (2009) 127–131

available at www.sciencedirect.com

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journal homepage: www.intl.elsevierhealth.com/journals/arob

Isolation of *Candida dubliniensis* in denture stomatitis

Cristina Marcos-Arias[a], José López Vicente[b], Ismail H. Sahand[a], Asier Eguia[b], Andoni De-Juan[b], Lucila Madariaga[a], José Manuel Aguirre[b], Elena Eraso[a], Guillermo Quindós[a,*]

[a] Laboratorio de Micología Médica, Departamento de Inmunología, Microbiología y Parasitología, Facultad de Medicina y Odontología, Universidad del País Vasco, Apartado 699, E-48080 Bilbao, Spain
[b] Unidad de Medicina Bucal, Servicio Clínica Odontológica, Departamento de Estomatología, Facultad de Medicina y Odontología, Universidad del País Vasco-Euskal Herriko Unibertsitatea, Bilbao, Spain

40 pts, 79 isolates

73% *C. albicans*

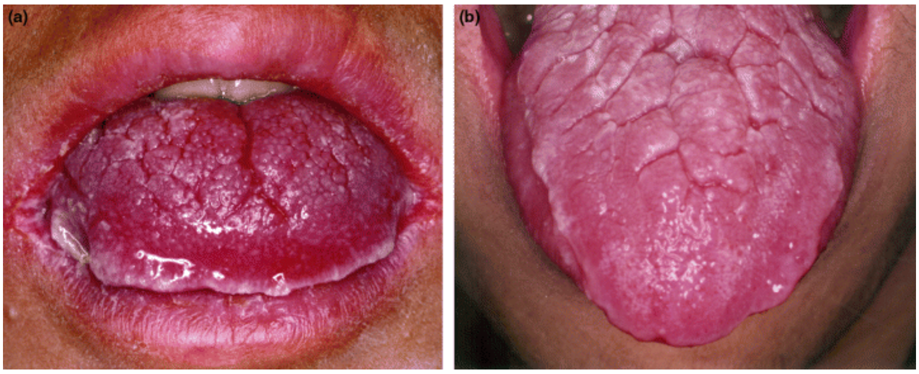
2% *C. dubliniensis*

cf. 1.5% to 32% HIV

Chronic mucocutaneous candidosis

- persistent/recurrent Candida infection:
  - skin
  - nails
  - mucosa
- familial or sporadic
- early or adult onset
- may be accompanied by endocrinopathy
  - CMC and endocrinopathy: APECED

CMC



Oral candidosis in APECED patients

- 56 APECED patients: HUS: 1994-2004.
- Grouped according to antifungal usuage past 30 years:
  1. 1-3 courses/year
  2. 4-6 courses/year
  3. >6 courses/year and/or continuous prophylaxis
- Identification and MIC data:
  - 11 APECED patients
  - 27 isolates
- Compared use of antifungals with MIC:
  - ketoconazole
  - miconazole
  - fluconazole

Journal of Antimicrobial Chemotherapy Advance Access published August 17, 2007

Journal of Antimicrobial Chemotherapy
doi:10.1093/jac/dkm299

JAC

Decreased susceptibility of *Candida albicans* to azole antifungals: a complication of long-term treatment in autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy (APECED) patients

Riina Rautemaa[1–3]*, Malcolm Richardson[1,4], Michael Pfaller[5], Pirkko Koukila-Kähkölä[4], Jaakko Perheentupa[6] and Harri Saxén[6]

[1]Department of Microbiology and Immunology, Haartman Institute, University of Helsinki, Helsinki, Finland; [2]Department of Bacteriology, Helsinki University Central Hospital HUSLAB, Helsinki, Finland; [3]Department of Oral and Maxillofacial Diseases, Helsinki University Central Hospital, Helsinki, Finland; [4]Department of Mycology, Helsinki University Hospital HUSLAB, Helsinki, Finland; [5]Medical Microbiology Division, Department of Pathology, College of Medicine, University of Iowa, Iowa City, IA, USA; [6]The Hospital for Children and Adolescents, Helsinki University Central Hospital and University of Helsinki, Finland

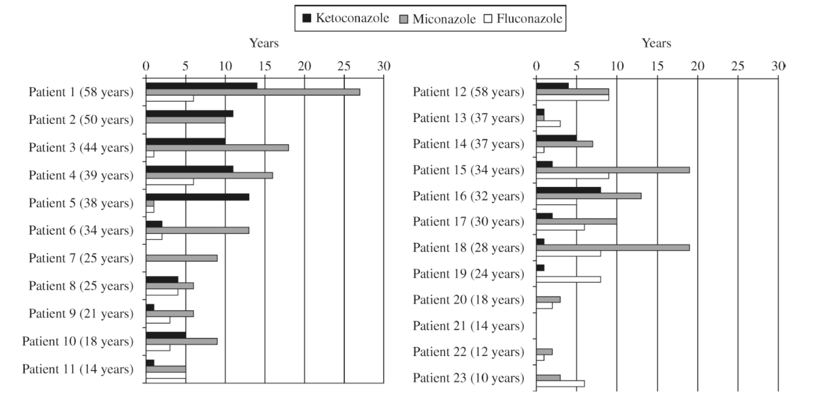


Figure 1. The years of usage of azole antifungals of the 23 APECED patients in the two patient groups (resistant group, left-hand panel; susceptible group, right-hand panel). Patients colonized with a *C. albicans* strain with decreased susceptibility to fluconazole had a history of more usage of ketoconazole.

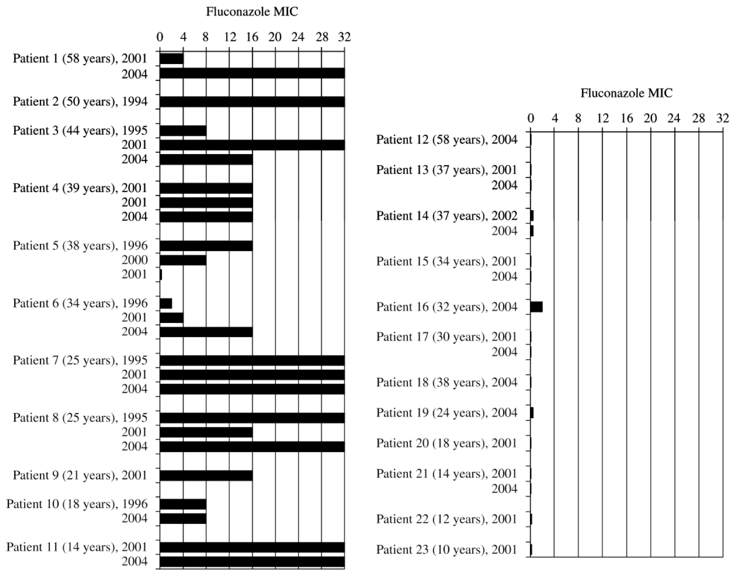


Figure 2. The fluconazole MICs of the *C. albicans* strains isolated from 23 Finnish APECED patients using a broth dilution technique as detailed in the CLSI document M27-A2. The MICs (mg/L) were significantly higher in the resistant group (left-hand panel). The colonization with the resistant strains seems to be persistent. Patient 5 was given eradication treatment for 1 week with intravenous liposomal amphotericin B and became colonized with a susceptible strain thereafter. Omitting all azoles since 2001 has not resulted in return of susceptible *C. albicans*.

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Diagnostic Microbiology and Infectious Disease 62 (2008) 182–185

DIAGNOSTIC MICROBIOLOGY AND INFECTIOUS DISEASE

www.elsevier.com/locate/diagmicrobio

Activity of amphotericin B, anidulafungin, caspofungin, micafungin, posaconazole, and voriconazole against *Candida albicans* with decreased susceptibility to fluconazole from APECED patients on long-term azole treatment of chronic mucocutaneous candidiasis☆

Riina Rautemaa[a,b,c,*], Malcolm Richardson[a,b], Michael A. Pfaller[d], Jaakko Perheentupa[e], Harri Saxén[e]

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Received 27 March 2008; accepted 22 May 2008

Table 1
Mean MICs and ranges of the FSDD and FS *C. albicans* isolates for azoles, echinocandins, and amphotericin B

	FSDD		FS		*P*
	Mean MIC (µg/mL)	Range (µg/mL)	Mean MIC (µg/mL)	Range (µg/mL)	
Azoles					
Fluconazole	23.520	16–32	0.505	0.12–8	<0.0001
Posaconazole	0.381	0.03–1.0	0.028	0.007–0.25	<0.0001
Voriconazole	0.353	0.12–1.0	0.013	0.007–0.12	<0.0001
Echinocandins					
Caspofungin	0.033	0.007–0.6	0.027	0.007–0.06	ns
Anidulafungin	0.022	0.007–0.12	0.030	0.007–0.12	ns
Micafungin	0.018	0.007–0.03	0.017	0.007–0.03	ns
Amphotericin B	0.368	0.250–0.750	0.386	0.250–0.750	ns

ns = not significant.

MLST (multi locus sequence typing)

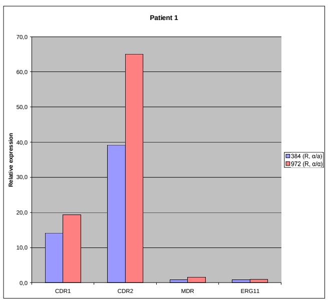
- Measures variation in DNA
- 7 “housekeeping” genes, within which c. 450-500 base-pair fragments (“alleles”) are sequenced
  - *AAT1a*
  - *ACC1*
  - *ADP1*
  - *MPI1b*
  - *SYA1*
  - *VPS13*
  - *ZWF1b*
- Aim: are the patient isolates identical or related?
- Steps:
  - PCR amplification
  - both DNA strands are sequenced
  - sequences entered into MLST databases:
    - existing sequence: assigned a genotype number (*C. albicans*)
    - new sequence: assigned a new genotype number

Odds and Jacobsen, 2008; Eukaryotic Cell 7: 1075-1084.

Pt no	Strain no	Year	MIC	MLST	MTL zygosity
1	**T-384**	2001	24	**1152**	α/a
	T-972	2004	64	**1156**	α/α
2	**T-564**	1995	1.0	360	**α/a**
	T-343	2001	64	360	**a/a**
3	**T-1375**	2006	48	1157	α/a
4	**T-355**	2001	48	**1151**	**α/a**
	T-1382	2006	8	1161	a/a
	T-1527	2007	32	1161	a/a
5	**T-931**	1996	8	1163	**α/a**
	T-366	2001	48	1163	**α/α**
	T-916	2004	32	1164	α/α
6	**T-344**	2001	32	1167	α/a
	T-1108	2004	128	1162	**a/a**
	T-1179	2005	32	1162	**α/a**
7	**T-695**	1995	48	1158	α/a
	T-373	2001	48	1158	α/a
	T-962	2004	128	**360**	α/a
8	**T-985**	2004	48	1154	α/a
	T-1270	2006	24	1160	α/a
9	**T-983**	2004	96	203	a/a

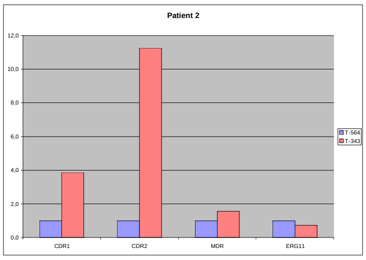
Patient 1

Year isolated	Fluconazole MIC	ST	MTL
2001	24	1152	α/a
2004	64	1156	α/α



Patient 2

Year isolated	Fluconazole MIC	ST	MTL
1995	1.0	360	α/a
2001	64	360	a/a
2007	24	360	a/a



Non-culture approaches to fungal diagnosis

	Candida	Aspergillus	Detection
Cell wall components	Mannans 1,3-β-D-glucans chitin	Galactomannan 1,3-β-D-glucans chitin	LA ELISA RIA Amebocyte lysate assay Spectrophotometry
Cytoplasmic antigens	Enolase HSP-90		ELISA Immunoblot
Metabolites	arabinitol	D-mannitol	GLC Mass spectroscopy
Genomic DNA sequences	C-14 lanosterol demethylase Chitin synthase Actin Aspartate proteinase Ribosomal RNA genes	C-14-lanosterol demethylase Alkaline protease Mitochondrial DNA HSP-90 Ribosomal RNA genes	PCR

FIEA ImmunoCAP

- IgE
- IgG
- ABPA:
  - asthma
  - cystic fibrosis
  - COPD
  - cavitary disease

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Diagnostic Microbiology and Infectious Disease 62 (2008) 287–291

DIAGNOSTIC MICROBIOLOGY AND INFECTIOUS DISEASE

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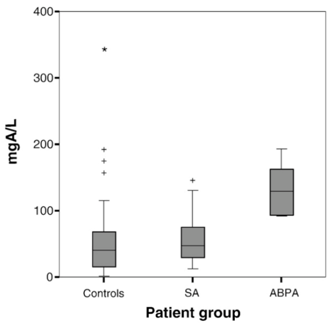
Mycology

Serologic diagnosis of allergic bronchopulmonary aspergillosis in patients with cystic fibrosis through the detection of immunoglobulin G to *Aspergillus fumigatus*

Richard C. Barton[a,*], Richard P. Hobson[d], Miles Denton[a], Daniel Peckham[b], Keith Brownlee[b], Steven Conway[b], Michael A. Kerr[c]

[a]*Department of Microbiology, Leeds Teaching Hospitals Trust, Leeds, UK*
[b]*Regional Cystic Fibrosis Centre, Leeds Teaching Hospitals Trust, Leeds, UK*
[c]*Department of Clinical Biochemistry and Immunology, Leeds Teaching Hospitals Trust, Leeds, UK*
[d]*University of Leeds, Leeds, UK*



JOURNAL OF CLINICAL MICROBIOLOGY, Jan. 2009, p. 129–133 Vol. 47, No. 1
0095-1137/09/$08.00+0 doi:10.1128/JCM.00506-08

Utility of Galactomannan Enzyme Immunoassay and (1,3) β-D-Glucan in Diagnosis of Invasive Fungal Infections: Low Sensitivity for *Aspergillus fumigatus* Infection in Hematologic Malignancy Patients▽

R. Y. Hachem,* D. P. Kontoyiannis, R. F. Chemaly, Y. Jiang, R. Reitzel, and I. Raad
The Department of Infectious Diseases, Infection Control and Employee Health, The University of Texas M. D. Anderson Cancer Center, Houston, Texas

TABLE 3. Performances of GM enzyme immunoassay and BG test for patients infected with different organisms (per sample)

Test and organism	Sensitivity (%)	Specificity (%)	PPV (%)[a]	NPV (%)[a]
GM enzyme immunoassay				
A. fumigatus (n = 69)	13	99	90	66
Non-*fumigatus Aspergillus* species (n = 39)	49	99	95	86
Other mold (n = 77)	6	99	83	62
BG test				
A. fumigatus (n = 69)	61	88	75	79
Non-*fumigatus Aspergillus* species (n = 39)	64	88	64	88
Other mold (n = 76)	47	88	72	72

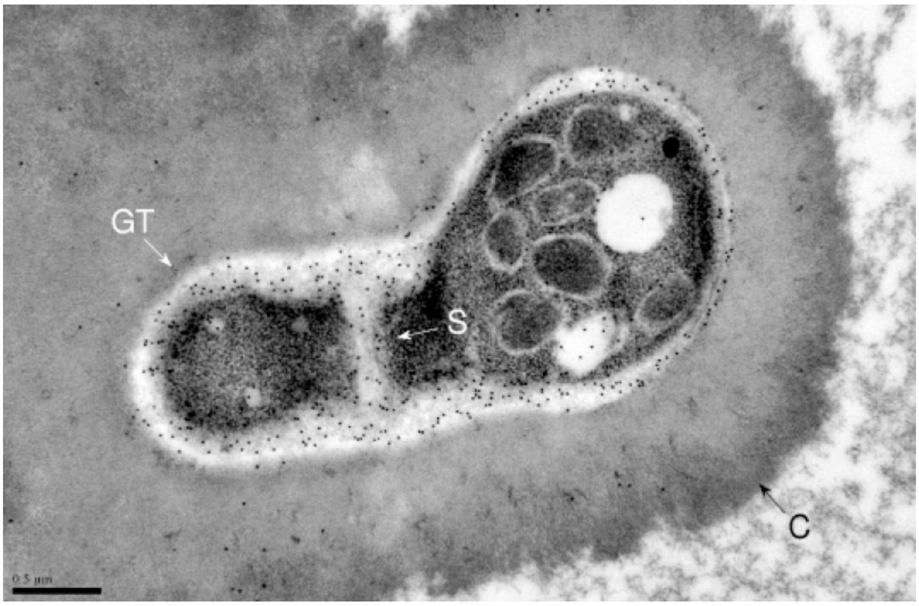
[a] PPV, positive predictive value; NPV, negative predictive value.

CLINICAL AND VACCINE IMMUNOLOGY, July 2008, p. 1095–1105 Vol. 15, No. 7
1556-6811/08/$08.00+0 doi:10.1128/CVI.00068-08

Development of an Immunochromatographic Lateral-Flow Device for Rapid Serodiagnosis of Invasive Aspergillosis▽

Christopher R. Thornton*
Hybridoma Laboratory, School of Biosciences, Geoffrey Pope Building, University of Exeter, Stocker Road, Exeter, Devon EX4 4QD, United Kingdom

- Premise: non-GM antigens may be useful surrogate markers
- Mouse Mab: JF5: protein epitope on extracellular glycoprotein antigen - secreted during active growth
- 15 min immunochromatographic lateral-flow device
- Very specific, no cross-reactivity

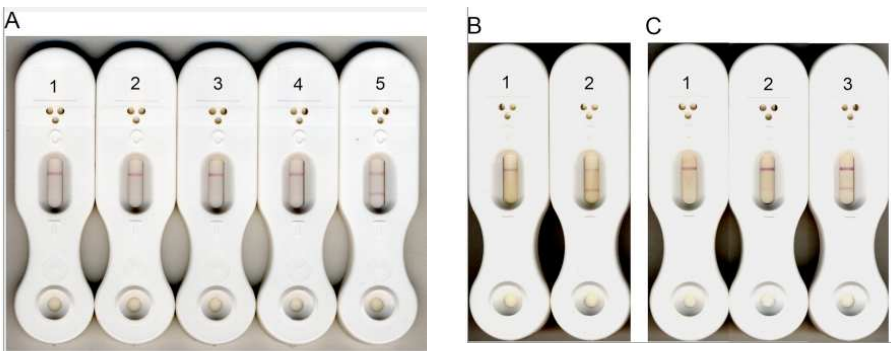


CLINICAL AND VACCINE IMMUNOLOGY, July 2008, p. 1095–1105 Vol. 15, No. 7
1556-6811/08/$08.00+0 doi:10.1128/CVI.00068-08

Development of an Immunochromatographic Lateral-Flow Device for Rapid Serodiagnosis of Invasive Aspergillosis[▽]

Christopher R. Thornton*

Hybridoma Laboratory, School of Biosciences, Geoffrey Pope Building, University of Exeter, Stocker Road, Exeter, Devon EX4 4QD, United Kingdom



Clinical and Vaccine Immunology, July 2008, p. 1095–1105 Vol. 15, No. 7
1556-6811/08/$08.00+0 doi:10.1128/CVI.00068-08

Development of an Immunochromatographic Lateral-Flow Device for Rapid Serodiagnosis of Invasive Aspergillosis[∇]

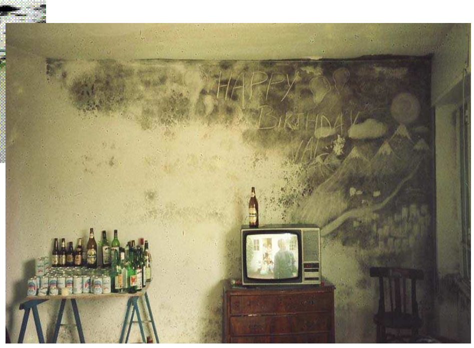
Christopher R. Thornton*

Hybridoma Laboratory, School of Biosciences, Geoffrey Pope Building, University of Exeter, Stocker Road, Exeter, Devon EX4 4QD, United Kingdom

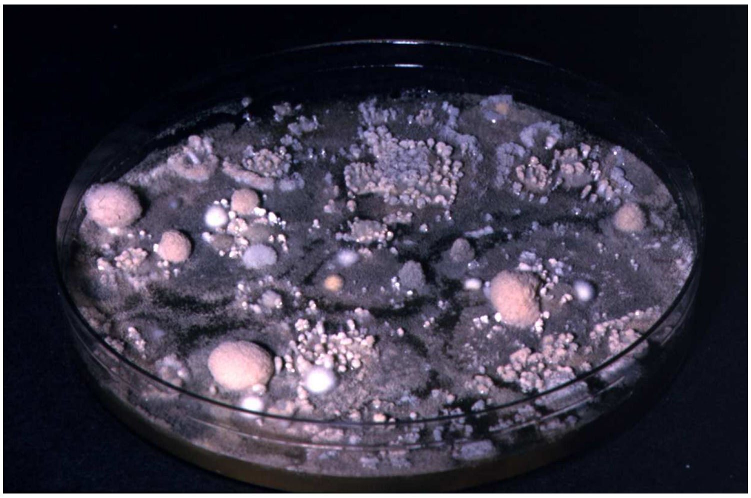
Results of LFD tests of serum samples from healthy individuals or from patients with known or suspected IA

Specimen no.	IA[a]	Platelia GM EIA index value	Platelia GM EIA result	Fungitell test β-glucan concn (pg/ml)	Fungitell test result	LFD result[b]
6OHD	No			45.90	Negative	−
7OHD	No			42.40	Negative	−
8OHD	No			44.30	Negative	−
9OHD	No			44.09	Negative	−
813	Yes	0.12	Negative	128.35	Positive	−
815	Yes	0.36	Negative	360.49	Positive	−
1263	Yes	0.16	Negative	111.72	Positive	−
1652	Yes	0.32	Negative	111.94	Positive	−
1655	Yes	0.35	Negative	104.13	Positive	+[c]
1657	Yes	0.71	Positive	122.23	Positive	±
1665	Yes	0.16	Negative	108.28	Positive	±
1667	Yes	0.30	Negative	142.19	Positive	±
1130	Probable	2.04	Positive	85.51	Equivocal	+
1131	Probable	1.52	Positive	219.61	Positive	+
1537	Probable	4.64	Positive	782.95	Positive	+[c]
1538	Probable	4.64	Positive	>500	Positive	+[c]

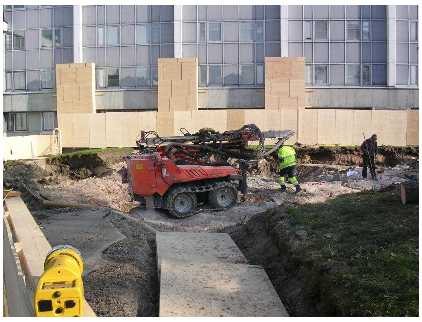
Patients live in mouldy houses: exposure to *Aspergillus* and more

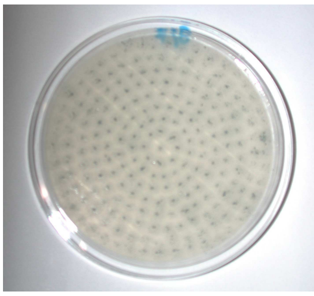


Aspergillus is in the air!



Heavy excavation!





Particle counting

- IQAir Particle Scan Pro Airborne Laser Counter
- 0.3µm - 5µm

Journal of Hospital Infection (2008) 68, 270–282

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www.elsevierhealth.com/journals/jhin

LETTERS TO THE EDITOR

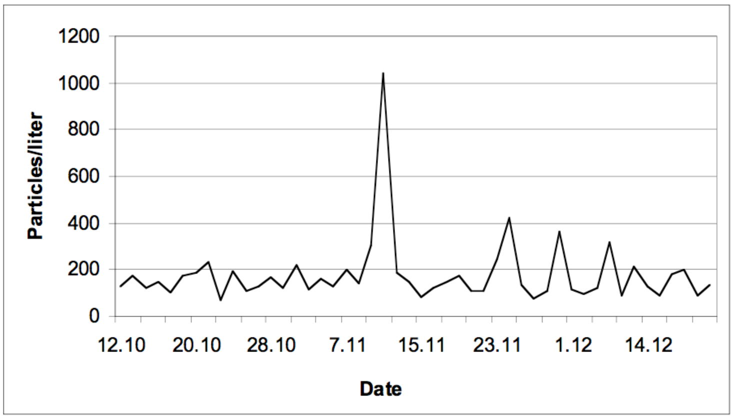
Routine sampling of air for fungi does not predict risk of invasive aspergillosis in immunocompromised patients

- 7-year sampling period: weekly: 978 samples
- *Aspergillus* spp. 16.7%: 1.8 cfu/m^3 - 28.3 cfu/m^3
- 45 cases proven IA (2.29% allo; 0.36% auto HSCT)
- cases of IA analysed 14 and 28-days following high counts
- Conclusion: high counts did not predict risk of developing IA

Rupp et al. JHI 2008.

Air quality monitoring of HEPA-filtered hospital rooms by particulate counting

Median particle counts of the patient rooms during a high risk period in 2005.



Anttila V-J, Nihtinen A, Kuutamo T, Richardson M. 2008.

Air quality monitoring of HEPA-filtered hospital rooms by particulate counting

Particle counts of different locations

Location	**Mean particle count (part/l)**	**Range**	**Number of measurements**
13 HEPA-filtered patient rooms of adult HSCT ward	174	7-6309	daily for 12 weeks
Intensive care unit (children), 3 patient rooms	5750	1370-21300	6 separate days
Regular adult patient ward - patient room - hallway	 7450 20870	 3200-10600 12000-29000	hourly for one day
Outside air	173659	110806-292624	6 separate days

Anttila V-J, Nihtinen A, Kuutamo T, Richardson M. 2008.

Indoor Air 2008; 18: 225–232
www.blackwellpublishing.com/ina
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INDOOR AIR
doi:10.1111/j.1600-0668.2008.00526.x

Use of (1-3)-β-D-glucan concentrations in dust as a surrogate method for estimating specific fungal exposures

- 297 dust samples
- QPCR: 36 indoor moulds
- Glucan assay:
  - *Cladosporium spp.*
  - *Aspergillus spp.*
  - *Epicoccum nigrum*
  - *Penicillium brevicompactum*
- *Alternaria alternata:* not a significant source of glucan

Y. Iossifova[1], T. Reponen[1], H. Sucharew[1], P. Succop[1], S. Vesper[2]

Molecular Identification of Filamentous Fungi from Water-Damaged Buildings

X. Lian[1,2], G.S. de Hoog[1], A.H.G. Gerrits van de Ende[1], M. Lackner[3], O. Priha[4], M.-L. Suihko[4], J. Houbraken[1], J. Varga[1,5], R.A. Samson[1], R.C. Summerbell[6], M. Richardson[7], P. Thompson[8], B. Mälarstig[9] and R. Stott[10]

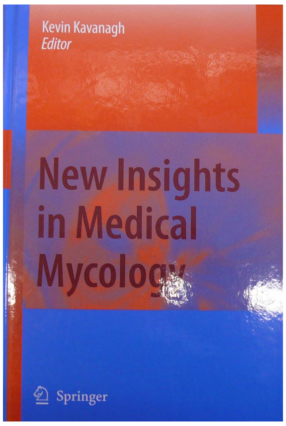
Table 2. Generic frequencies of identified fungal strains.

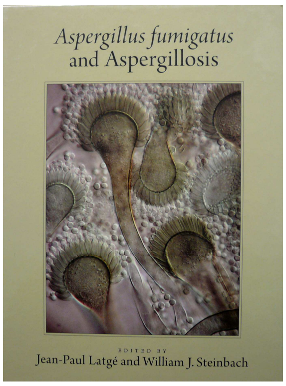
Genus	Number of strains	Percentage (%)
Penicillium	97	41.45
Aspergillus	34	14.51
Cladosporium	27	11.54
Trichoderma	18	7.69
Acremonium	13	5.56
Phoma	11	4.70
Ulocladium	10	4.28
Paecilomyces	3	1.28
Stachybotrys	3	1.28
Chaetomium	3	1.28
Gliomastix	2	0.85
Eurotium	2	0.85
Rhizopus	2	0.85

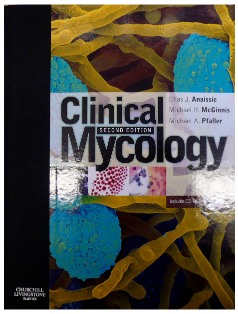
Learning points
"Think fungus!"

- The field of medical mycology has become an extremely challenging study of infections caused by a wide of and taxonomically diverse array of opportunistic fungi.
- Key message: there are no non-pathogenic fungi - the extent of infection relies on the degree of immunosuppression, and exposure.
- No fungus should be dismissed out of hand as a contaminant.
- Many of the emerging mycoses are inherently non-susceptible to standard azole or polyene antifungals.

New books





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ASPERGILLOSIS
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