

# ECMM

European Confederation of Medical Mycology

# CEMM

Confédération Européenne de Mycologie Médicale

## Great hits in Mycology

**T**hings are going well with medical mycology in Europe. We witnessed a balanced, dynamic and very well organized TIMM3 in Torino, Italy. Our specialty has arrived where it belongs, in the center of infectious diseases and alongside with the other specialties of clinical microbiology. It is the close cooperation with our clinical colleagues at the EORTC IDG that brings this diversity and collaboration in Europe. Trends in Medical Mycology has become the international meeting ground for all professionals working with and against fungi and fungal infections. While many people still think that "The best things in life are free" it requires hard work, meticulous preparation and planning to run a successful meeting like this. I would like to thank the executive committee consisting of Claudio Viscoli, Marianna Viviani, Thierry Calandra and Maiken Cavling Arendrup, with help of the enthusiastic local Italian colleagues and support of the PCO Congress Care, for their efforts.

Now it is time to look ahead. Our goal should be to outperform the next time. Without doubt the upcoming TIMM4 executive committee, George Petrikos, Emmanuel Roilides, Maiken Cavling Arendrup and Johan Maertens is eager to start making the first arrangements for 2009 in Athens, Greece. Although our bi-annual conference is the flagship of ECMM, the Confederation is doing several other things which are of equal importance. Still there is an increasing demand for well trained and well informed doctors regarding opportunistic fungal infections in Europe. Therefore educational meetings are organized every other year in

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The ECMM Council at TIMM3 in Torino. From left: K. Mencl (Czech Rep.), M. Ullberg (Sweden), C. Lass-Flörl (Austria), M.C. Arendrup (Nordic Soc.), J. Meis (The Netherlands), A.Y. Sergeev (Russia), I. Surmont (Belgium), M. Schaller (Germany), S. Arikian (Turkey), M.A. Viviani (Italy), B. Dupont (France), E. Segal (Israel), E. Roilides (Greece), L. Rosado (Portugal), J. Pemán García (Spain)

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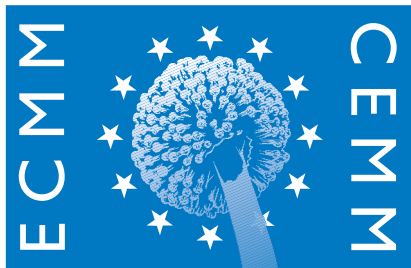
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ECMM/CEMM

*Mycology Newsletter*

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Secretary: M. Babic  
Membership 2005: 19  
National meeting: twice a year

**Netherlands Society for Medical Mycology (NVMy)**

President: J.F.G.M. Meis (*ECMM delegate*)  
Secretary: E.P.F. Yzerman  
Treasurer: M.H. Dammer  
Scientific Secretary: G. S. de Hoog  
Membership 2007: 139  
National meetings: 1-2 April 2008, Arnhem  
Newsletter: NVMy Newsletter  
Website: www.nvmy.nl

**Nordic Society for Medical Mycology (NSMM)**

President: M.C. Arendrup (*ECMM delegate*)  
Vicepresident: M. Richardson  
Secretary: P. Gaustad  
Treasurer: D.M.L. Saunte  
Membership 2007: 214  
Scientific Meeting: 22 May 2008, Stockholm  
Newsletter: at web site  
Website: www.nsmm.nu

**Polish Dermatologic Society-Mycology Section**

President: E. Baran  
Vicepresident: Z. Adamski, R. Maleszka  
Secretary: J.C. Szepietowski (*ECMM delegate*)  
Treasurer: R. Bialynicki-Birula  
Membership 2006: 98  
Journal: Mikologia Lekarska (Medical Mycology)

**Romanian Society of Medical Mycology and Mycotoxicology (RSMMM)**

President: M. Mares (*ECMM delegate*)  
Vicepresident: B. Doroftei  
Managing Editor: I. Ailincai  
Secretary: A. Stefanache  
Treasurer: L. Malic  
Membership 2007: 56  
National meeting: National Meeting every two years and Congress every four years  
Journal: Fungi & Mycotoxins  
Books: Syntheses of Medical Mycology (for Continuing Medical Education)  
Website: www.fungi.ro / www.journal.fungi.ro

**Société Belge de Mycologie Humaine et Animale/Belgische Vereniging Voor Menselijke en Dierlijke Mycologie**

President: I. Surmont  
Vicepresident: K. Lagrou (*ECMM delegate*), F. Symoens  
Secretary: M. Van Esbroeck  
Treasurer: M.-P. Hayette  
Scientific Secretary: E. De Laere  
Membership 2007: 183  
Website: www.medmycol.be

**Société Française de Mycologie Médicale**

President: B. Dupont (*ECMM delegate*)  
Vicepresident: N. Contet-Audonneau, R. Grillot, C. Guiguen  
Secretary: P. Roux  
Treasurer: A. Detry  
Membership 2007: 350  
National meetings: May 15-16, 2008, Tours; November 2008, Paris  
Journal: Journal de Mycologie Médicale  
Website: www.mycolmed.chez.tiscali.fr

**Swedish Society for Clinical Mycology**

President: J. Faergemann  
Vicepresident: T. Kaaman  
Secretary: L. Klingspor (*ECMM delegate*)  
Treasurer: M.L. von Rosen  
Membership 2006: 80  
National meeting: 22 May 2008, Stockholm (joint meeting with Nordic Society for Medical Mycology)

**Turkish Microbiological Society Mycology Section**

President: Ö. Ang  
Secretary: A. Ağaçfidan  
Treasurer: D. Yaylali  
*ECMM delegate*: E. Tümbay  
Membership 2007: 150  
Newsletter: Bulletin of the Turkish Microbiological Society

## ECMM Affiliated Societies

(Information provided by the member Societies)

**All-Russian National Academy of Mycology**

President: Y.V. Sergeev  
Vicepresident, Head of Medical Section: S.A. Burova  
Secretary: A.Y. Sergeev (*ECMM delegate*)  
Treasurer: V.M. Leschenko  
Membership 2007: 246  
Website: www.mycology.ru

**Associação Portuguesa de Micologia Médica (ASPOMM)**

President: M. Rocha  
Vicepresident: R.M. Velho  
Secretary: M.L. Rosado (*ECMM delegate*)  
Treasurer: M. Gardete  
Membership 2007: 50

**Asociación Española de Micología (AEM) Sección de Micología Médica**

President: J. Pontón San Emeterio  
Vicepresident: C. Rubio  
Secretary: F.J. Cabañas Saenz  
Treasurer: F.L. Hernando Echevarría  
President Medical Mycology Section: J. Pemán García (*ECMM delegate*)  
Membership 2007: 145  
National meeting: Every two years.  
A workshop meeting ("Forum Micológico") is scheduled the years between National Meetings  
Journal: Revista Iberoamericana de Micología  
Website: www.reviberoammicol.com/AEM

**Austrian Society for Medical Mycology (ASMM)/Österreichische Gesellschaft für Medizinische Mykologie (ÖGMM)**

President: B. Willinger  
Vicepresident: C. Lass-Flörl (*ECMM delegate*), H.-J. Dornbusch  
Secretary: W. Buzina  
Vicesecretary: G. Ginter-Hanselmayer  
Treasurer: C. Speth  
Vice-treasurer: J. Rainer  
Membership 2007: 122  
National meeting: twice a year  
Website: www.oegmm.at

**British Society for Medical Mycology (BSMM)**

President: E. M. Johnson (*ECMM delegate*)  
General Secretary: R.P. Hobson  
Meetings Secretary: G. Moran  
Treasurer: D.M. MacCallum  
Membership 2007: 302  
National meeting: March 30th - April 1st, 2008, Norwich  
Newsletter: BSMM Newsletter  
Website: www.bsmm.org

**Bulgarian Mycological Society (BMS)**

President: T. Kantardjiev (*ECMM delegate*)  
Vicepresident: G. Mateev  
Secretary: A. Kouzmanov  
Treasurer: T. Velinov  
Membership 2007: 50  
National meeting: 3-6 April 2008  
Website: www.bam-bg.net

**Committee for Medical Mycology of Czechoslovak Society for Microbiology (CSSM)**

President: K. Mencl (*ECMM delegate*)  
Secretary: P. Hamal

Treasurer: J. Gabriel  
Membership 2007: 16  
Newsletter: Bulletin of CSSM

**Danish Society for Mycopathologia**

President: J. Stenderup (*ECMM delegate*)  
Vicepresident: B. Andersen  
Secretary: B. Knudsgaard  
Treasurer: J. Stenderup  
Membership 2006: 25  
National meeting: twice a year  
Newsletter: Report from the Danish Society for Mycopathology

**Deutschsprachige Mykologische Gesellschaft e.V. (DMyKG)**

President: M. Ruhnke  
Vicepresident: O. Cornely  
Secretary: H. Chr. Korting  
Treasurer: C. Hipler  
*ECMM delegate*: M. Schaller  
Membership 2007: 478  
National meeting: 4-6 September, 2008, Jena  
Journal: Mycoses  
Newsletter: Mykologie Forum (4 issues/year)  
Website: www.dmykg.de/start2.html

**Federazione Italiana di Micopatologia Umana e Animale (FIMUA)**

President: L. Pagano  
Vicepresident: E. Difonzo  
Secretary: F. De Bernardis  
Treasurer: A.M. Tortorano  
*ECMM delegate*: M.A. Viviani  
Membership 2007: 160  
National meeting: November 20-22, 2008, Catania  
Website: www.fimua.it

**Finnish Society for Medical Mycology**

President: R. Visakorpi  
Vicepresident: T. Putus  
Secretary: L. Naire-Koivisto  
Treasurer: O. Lindroos  
*ECMM delegate*: P. Kausela  
Membership 2007: 88  
Newsletter: Sienet ia Terveys (Fungi and Health)

**Hellenic Society of Medical Mycology**

President: G.L. Petrikkos  
Vicepresident: G. Samonis  
Secretary: A.M. Ziouva  
Treasurer: O. Nikolaitou-Galiti  
*ECMM delegate*: E. Roilides  
Membership 2007: 81  
Website: www.hsmm.gr

**Hungarian Dermatological Society Mycology Section**

President: G. Simon (*ECMM delegate*)  
Secretary: G. Fekete  
Membership 2005: 59

**Israel Society for Medical Mycology**

President: E. Segal  
Vicepresident: I. Polacek  
Secretary: I. Berdicevsky (*ECMM delegate*)  
Treasurer: D. Elad  
Membership 2007: 50  
National meeting: twice a year

**Mycology Group of Bosnia Hercegovina**

President: L. Ozegovic (*ECMM delegate*)

## Great hits in Mycology

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between TIMM. In the coming year ECMM will organize, in collaboration with the Turkish National Society, two educational symposia during the XII International Congress of Mycology part of the International Union of Microbiological Societies (IUMS) meetings from 5-9 August 2008 in Istanbul. If a national society, of course with support of ECMM, is interested in running similar Educational activities in Europe in 2010 please get your proposal to the General Secretary for consideration. But we do not stick only to Europe. ECMM has been the first organization, together with ISHAM, in supporting African mycology since the formal erection of the Pan-African Medical Mycology Society in 2005. We have financially supported the first two meetings in South Africa (2005 and 2007). The next meeting of this young neighbor society will be in the beginning of 2009 in Nigeria, West-Africa. It might be interesting for some of us to participate and start new collaborations with African colleagues.

Not everybody has the chance to visit meetings and educational activities. Therefore it is with great pleasure to notice that web-based learning and teaching in Mycology has entered Europe. The British Society for Medical Mycology is running a successful course in Medical Mycology based at the University College of London. The president of the British Society, Elisabeth Johnson and the course Director Chris Kibbler have expressed their ambition to extend the recruiting of students to the "continent". ECMM can only wholeheartedly support this action of increasing the number of highly qualified medical mycologists throughout Europe. Other news is the expansion of the Confederation with a new member; the Romanian Society of Medical Mycology and Mycotoxicology. We welcome you and hope that you going to feel at home in our family. Unfortunately not all European countries have a representation yet in the Confederation. If there are initiatives out there do not hesitate to call upon the executive committee for help or advise.

You might have noticed that ECMM has a website in the air and you might think that it is not a very com-

petitive site compared with other societies. Furthermore you might say that a website is nowadays the digital heart of a society. I am the first to agree with your opinion. In view of these considerations the council meeting in Torino has decided to put our website ([www.ecmm.eu](http://www.ecmm.eu)) under major reconstruction. Given the fact that "many hands make the job an easier job" the Confederation installed a website committee under the direction of Alexey Sergeev, which will start on short notice to accomplish a modernization and refurbishing of our site. The plan is that it is going to contain news, links, announcements, contact addresses and so on. The next year will also be a change in the organizational aspects of the ECMM. Executive council members generally have a 3 year term with the possibility for re-election for another 3 years. After 6 years in office both the general secretary, Emmanuel Roilides and the treasurer, Martin Schaller, will be completing their final term in the coming year. This means that members

of the Council Meeting will have to elect new officials at the next meeting during IUMS in Istanbul in August. Although I am prepared to continue for another term, the office of president is also open for (re)election since my 3 year term is ending. ECMM delegates eligible to vote will receive more information in due time.

Finally since TIMM4 in Athens is on track local societies should start to think about TIMM5. Which country is able and willing to host our major meeting in 2011? If you have plans or just would like to inquire, contact one of the members of the executive committee.

The year 2007 runs to an end. I wish that you achieved all your personal goals set for this year. ECMM will fly into a new episode and we have things to look forward too in 2008. *Aperta quoque apertiora fieri solent.*

Jacques F. Meis  
ECMM President

TIMM  
Trends in Medical Mycology  
www.TIMM2009.org  
First Announcement

EORTC

4<sup>th</sup> Trends in Medical Mycology  
18 - 21 October 2009  
Hotel Hilton Athens  
Athens, Greece

**T**he Romanian Society of Medical Mycology and Mycotoxicology (RSMMM) is a professional organization recently established (2006) by microbiologists, clinicians, veterinarians and pharmacists, in order to combine their efforts to improve the diagnosis and control of fungal diseases in Romania. Now with 56 active members, it also includes specialists working in state- or privately-owned diagnostic laboratories, research institutions, universities, and students.

We exist because the last decades have brought great changes in the infectious pathology, opportunistic microorganisms – especially fungi, being involved more and more frequently in infections of increasing gravity; because in Romania there is a discrepancy between the rising trend of mycoses and the capacity to control them; because the training of medical mycologists is made now and then and it is insufficiently organized; because the Romanian resources are poor in clinical mycology studies so necessary to understand the augmentation tendency of mycotic diseases incidence in the general clinical context; because it is not known exactly the mycoses etiological spectrum which occur in patients from our region and there are no data concerning the antifungal susceptibility profile of implied strains; and last but not least, because we should not ignore the essential – the fact that behind these figures there

# The Romanian Society of Medical Mycology and Mycotoxicology

is the human suffering whose comfort justifies any effort.

The mission of the Romanian Society of Medical Mycology and Mycotoxicology is to improve the diagnosis, treatment and prevention of fungal diseases in Romania. Our society promotes basic and applied knowledge, as well as training and education, across the main fields of medical mycology and mycotoxicology.

The RSMMM's executive power is represented by Executive Council that is elected by the membership every four years during the Assembly of Members. As scientific meetings, RSMMM organize a national conference every two years and a congress every four years.

Membership categories: active members (voting members entitled to all benefits, including official publications; reduced fees for young – less 30 years, and retired colleagues), honorary members and supportive members. Membership places the colleagues within a community that benefits from participation in an open, young and collaborative organization.

RSMMM Study Groups comprise professionals with a common interest and are open to all colleagues who wish to be involved in discussing and resolving professional issues – Antifungals, Fungemia, Oral mycoses, Mycotoxins.

*Fungi & Mycotoxins* is the official peer-reviewed journal of the RSMMM, published twice yearly, in April and October. Manuscripts that present reviews or results of original basic and applied research in all fields of medical, veterinary and environmental mycology and mycotoxicology may be submitted. The journal is published in two variants – printed and on-line ([www.journal.fungi.ro](http://www.journal.fungi.ro)).

Mihai Mares  
President of the RSMMM



Mihai Mares, RSMMM President (on the left), and Ionut Ailincai, Managing Editor



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<http://www.journal.fungi.ro>



## Difend: an online registry of invasive pulmonary mould disease

Some 3 years ago an initiative was undertaken in the Netherlands to set up an online registry of invasive pulmonary mould disease. To this end Sineke Puister of Pfizer BV offered to put us into contact with Esther van Noort of Curavista BV, a company that provides an independent eConsult system for patients and doctors. A registry seems deceptively easy. Build a database that includes demography, diagnosis, therapy and outcome, make it available on-line and the rest is easy. However first we had to set down the ground rules. These were to collect sufficient information whilst avoiding questionnaire fatigue - this arises when the amount of data far exceeds capacity and willingness of the participants to collect the data. The next problem was to decide how to build the database. I had already developed a local database to accommodate the EORTC/MSG definitions. This provided us with a core. The next step was to gather interested parties round the table. Here we were joined by Ad Dekker of The University Hospital of Utrecht and Geert-Jan Timmers of the Vrije Universiteit Amsterdam. We eventually settled on 23 questions which were divided into 4 chapters: Inclusion, Intake, Outcome after 6 weeks and Outcome after 26 weeks. Curavista BV wrote the programme and we tested it until it worked reliably. Importantly the anonymity of the patient is guaranteed as each case entered is allocated a number and this procedure was approved as being consistent with the Dutch Regulations on Protecting Privacy. In the Netherlands and Belgium this allowed us to proceed with Ethics Committee approval

without having to ask for the patient's consent. However it does mean that the participant has to keep a record of the number in order to be able to identify the case. If this is not done then no case entered can be traced back to a particular patient.

The system went live in 2004 and since then we have a 101 cases with follow-up for 6 weeks. Only 6 were proven cases (Figure) and the majority were classified as probable cases. The database will also allow us to look at the contribution of CT scan and mycological investigations to the diagnosis as well as to look at outcome in relation to the underlying disease and its status, the procedure used and also whether or not prophylaxis was given. We will also be able to look at the nature and duration of therapy.

Recently we were joined by Johan Maertens of the University Hospital of Leuven and Bart Span of the University Hospital Maastricht which means that there are now 146 cases entered. Janos Sinko of the Lazlo Hospital in Budapest will also be joining the project.

Despite its success as a registry, we wanted to offer the registry to a wider public than has been possible hitherto so it was decided to seek a place within the ECMM. This would also ensure independence. Although not an epidemiological survey the registry can give us a better idea on the occurrence of invasive pulmonary mould disease than is now possible. We would therefore encourage any who are interested to test the website by contacting me by mail: ([P.Donnelly@usa.net](mailto:P.Donnelly@usa.net)).

*Peter Donnelly*

### THE DIFEND REGISTRY

#### Why

to obtain a better estimate of the number of pulmonary mould mycosis occurring amongst high-risk patients

#### What

an electronic database for registering pulmonary mould mycosis among patients at high-risk

#### How

online entry via a secure website

#### Who

centres treating patients for haematological malignancies and those providing stem cell transplantation

#### When

from 2004 onwards



## ECMM Epidemiological Survey on Zygomycosis in Europe

A very interesting meeting of the Zygomycosis Working Group of ECMM was held during the TIMM in Torino. The first analysis of the cases was accepted at this conference as an oral presentation. One hundred and thirty-nine cases, from 11 countries, were analyzed (Italy 45, Greece 26, Germany 20, France 15, Austria 10, Spain 9, Russia 5, Belgium 4, Finland 2, Norway 2 and UK 1). Representatives from Italy, Germany,

Austria, Spain, Belgium and Greece said that they will soon have more cases. In addition, two colleagues from Portugal said that they have cases which they want to submit. The first analysis showed that haematological malignancy correlated with pulmonary disease and underlying diabetes mellitus correlated with rhinocerebral disease.

Regarding the diagnosis methods, it was noted that 80 (57.55%) cases were con-

## IUMS 2008 Istanbul

Friday 8 August 2008, h. 16.00 - 18.00

**ECMM WG: Zygomycosis** (Parallel Symposium 11)

Chair G. Petrikkos (GR)

Co-chair E. Tümbay (TR)

G. Petrikkos (GR)	Epidemiology of Zygomycosis in Europe
E. Roilides (GR)	Pathogenesis and Host Defense against Zygomycetes
E. Dannaoui (FR)	Conventional and Molecular Diagnostic Methods
A. Groll (DE)	Pharmacology of Antifungal Agents against Zygomycosis
L. Pagano (IT)	Antifungal Prophylaxis and Therapy of Zygomycosis

Zygomycosis has emerged as a major cause of morbidity and mortality, mainly in patients with haematological malignancies or diabetes, as well as in immunocompetent patients who sustain trauma or burns. Its pathogenesis is not fully understood yet, but many interesting aspects of it, including the host's defences, have been studied. Rapid diagnosis is of paramount importance and, in addition to conventional methods, such as direct microscopy and cultures, new molecular techniques are being investigated. Amphotericin B has been the only available drug for the treatment of zygomycosis, but recently, posaconazole has also been shown to be effective. Early diagnosis and appropriate treatment may improve the outcome.

firmed by culture (22 only culture, 58 histology and culture) and 13 (9.35%) only by histology. The most commonly isolated fungi were *Mucor* sp.(35) and *Rhizopus* sp. (29). Statistical analysis showed that patients who had received voriconazole prior to the diagnosis of zygomycosis had a higher mortality ( $p=0.009$ ), but this result needs further analysis.

The study is supported by an unrestricted grant by Gilead.

It was decided that the study will go on until the end of 2007. A data review committee will study the results.

More data will be presented in Istanbul, during the IUMS Congress; see in the box the preliminary program of our Symposium.

*Georgios L. Petrikkos*



## ECMM Working Group on *Candida* Infections in ICU Surgical Patients in Europe

The distribution of *Candida* species isolated from 360 patients included in the study is the following:

57.5%	<i>C. albicans</i>
17.0%	<i>C. glabrata</i>
13.0%	<i>C. parapsilosis</i>
5.0%	<i>C. tropicalis</i>
1.4%	<i>C. krusei</i>
1.1%	<i>C. lusitanae</i>
5.0%	other <i>Candida</i> spp.

The study started September 1st, 2006 and is extended to 31st of December, 2008. The aim is to include 75 patients from each of 18 participating countries for a total of 1350 patients.

So far, patients included in the study are 372 from 12 out of 18 participating countries: Italy 112 cases, Austria 63, Greece 60, Czech 33, Sweden 30, Spain 22, Netherlands 15, Germany 12, France 10, Finland 6, UK (Cardiff) 5, Switzerland 4. Additional 75 pa-

tients from Denmark will be included. No report from Turkey, Hungary, Portugal, Norway and Bulgaria. Representatives from Hungary, Portugal and Norway confirmed that they will participate in the study. No representatives from Turkey or Bulgaria were present at the meeting. They will be contacted again.

Dr. N Longley (UK) presented data collected from representative European ICUs concerning the use of different diagnostic procedures and anti-infective practices, in order to provide the background of the current survey study (*Poster 216: ECMM survey of risk factors and practice in the management of invasive yeast infections in European surgical intensive care units*).

Prof. A.M. Tortorano presented data from Italy (*Oral communication 07: ECMM-FIMUA survey on invasive fungal infections in ICU: ad interim analysis after 12 months*).

The Working Group has received an unrestricted grant from Merck Sharp & Dohme.

Preliminary data of the Working Group will be presented by Dr. Klingspor in Istanbul, during the IUMS Congress; see in the box the preliminary program of our Symposium.

*Lena Klingspor*

## IUMS 2008 Istanbul

Friday 8 August 2008, h. 13.30 - 15.30

**ECMM WG: Invasive fungal infections in the intensive care** (Parallel Symposium 11)

Chair J. Meis (NL)

Co-chair L. Klingspor (SE)

J. Meis (NL)	Introduction to the problem of invasive fungal infection on the intensive care
A.M. Tortorano (IT)	<i>Candida</i> infections in the ICU
S. Arikan (TR)	Filamentous fungal infections in the ICU
M. Akova (TR)	Risk factors and prophylaxis of fungal infections in ICU
G. Samonis (GR)	Antifungal therapy of fungal infections in ICU
L. Klingspor (SE)	Epidemiology of candidosis in European intensive care units

The increasing use of high grade supportive care in severe and life threatening diseases, especially in intensive and neonatal care units, has created a shift in hospital populations at risk for opportunistic fungal infections. This medical progress has led to a change in the epidemiology of invasive fungal infections. In this symposium the changing epidemiology, diagnostic approaches, prophylaxis and therapy of fungal infections in the intensive care unit will be discussed.

Special report on...

# 3<sup>rd</sup>



EORTC



## Trends in Medical Mycology

### Joint meeting of the 12<sup>th</sup> ECMM and 9<sup>th</sup> TIFI



One of the premier medical mycology congresses within the European context is the Trend in Medical Mycology conference (TIMM). With previous Trends being held in Amsterdam and Berlin it was Turin's turn. A very successful and varied programme took place on 28-31 October 2007. This was the largest TIMM so far with about 1200 participants from 57 countries, demonstrating the increasing interest in medical mycology.

Many new developments in all fields of medical mycology were represented. Medical mycologists, microbiologists and clinicians presented the results of their studies. Invited international opinion leaders gave many interesting lectures on a wide range of medical mycology topics, both old and new. Professor Antonio Cassone opened the Congress with "The E. Drouhet Lecture" on Antifungal Vaccines.

We observed, with great pleasure, a high participation from younger colleagues and one of them, Ferry Hagen from Netherlands, received the "Young Travel Award" with an interesting paper on the molecular biology of infections caused by *Cryptococcus gattii*. Furthermore, it was encouraging to see a record number of free papers and posters: there were more than 300 contributions that covered all the aspect of mycology (molecular biology, microbiology, epidemiology, antifungal treatments, etc).

During the Congress many different organisations and societies took the opportunity to hold committee meetings, seminars and working group discussions, including the ECMM Council, the EORTC-IDGM, a meeting of the ISHAM Working Group on *Malassezia*, the ECMM Working Group on *Candida* and candidosis in the ICU, and a meeting of the ECMM Zygomycosis Working Group. These informal meetings gave the members of these various activity groups the possibility to participate in productive discussions on the results of on-going studies and to plan future programs. Finally the next TIMM meeting is planned for 18-21 October 2009 in the Athens Hilton Hotel, Athens, Greece. We hope that this progressive increase in the interest on fungal infections will encourage an even larger participation. Visit the Congress Care (<http://www.congresscare.com/index.php>) web site for further details.

Livio Pagano and Malcolm Richardson

The Programme and the Abstracts of the TIMM3 were published in "Journal of Chemotherapy", vol. 19, Supplement 3, October 2007. To retrieve a copy of the Supplement 3 go to [www.jchemother.it](http://www.jchemother.it) The following is a direct link to the supplement which you can paste onto your browser:

<http://www.jchemother.it/cgi-bin/digisuite.exe/products?ID=134>





## The E. Drohuet Lecture

# Antifungal vaccines

At the 3rd Trends in Medical Mycology the prestigious E. Drohuet Lecture, an international recognition for the most distinguished researchers in the field, was given by Antonio Cassone, from the Istituto Superiore di Sanità, Rome, Italy, who intrigued the audience of the Plenary Session 1 with the talk “Antifungal vaccines”.

After a comprehensive review of the frustrating challenge that the identification of suitable fungal targets may represent for vaccinologists, Prof. Cassone has proposed a revolutionary approach for protecting immunocompromised patients even against multiple mycoses (i.e., candidiasis, aspergillosis, cryptococcosis) with a single, well-defined  $\beta$ -glucan-protein conjugate vaccine eliciting antibodies exerting direct antifungal effects *in vitro* and conferring passive transfer of immunity to naive animals that was prevented by adsorption of antibodies on  $\beta$ -glucan particles.

Previous attempts to produce protein conjugate vaccines for fungi were hampered by the use of heterogeneous polysaccharide preparations. To avoid any likely contamination with other fungal cell wall antigens, laminarin from *Laminaria digitata*, a well characterized  $\beta$ -glucan preparation of non fungal source, was selected as specific antigen. As most free polysaccharides, laminarin is a poor immunogen thus it was conjugated with the diphtheria toxoid CRM197, a protein carrier generally used in other human glyco-conjugate vaccines. The algal nature of the polysaccharide antigen demonstrates that the vaccine works by eliciting antibodies cross-reactive with microorganisms which belong to a different kingdom from fungi thus rejecting the dogma that vaccines should rely on the immune response elicited against the specific etiologic agent of the disease.

The realization that fungicidal antibodies may be protective against most



Antonio Cassone

major fungal pathogens inspires the paradigm shift that, in analogy with bacteria and viruses, antifungal vaccine efficacy may not require cellular or other arms of the immune system. The recognition of  $\beta$ -glucan in the cell walls of pathogenic fungi supports the previously unrecognized potential of cross-reactive antibody-mediated immunity.

The novel laminarin-CRM197 conjugate represents the original proof of concept that a single vaccine may be broadly protective against many transphylectic pathogens and deserves consideration for future preclinical and clinical studies.

Luciano Polonelli



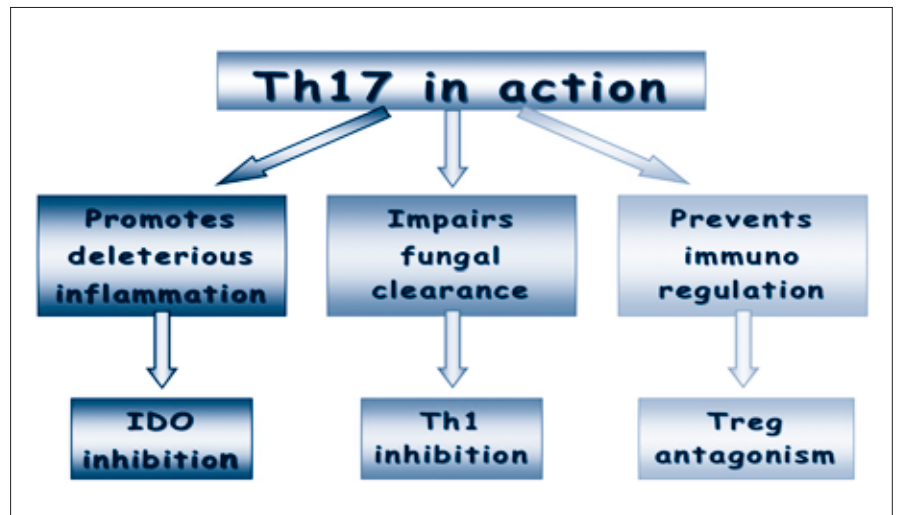
# Controlling pathogenic inflammation to fungi: the contribution of the Th17 pathway

Inflammation is a key feature of fungal infections and diseases. The inflammatory response to fungi may serve to limit infection but an overzealous or heightened inflammatory response may contribute to pathogenicity, as documented by the occurrence of severe fungal infections in patients with immunoreconstitution disease or primary immunodeficiencies associated with heightened immune reactivity. These patients may experience intractable fungal infections despite the occurrence of pathogen-specific immunity. IL-12, by initiating and maintaining Th1 responses, was thought to be responsible for overreacting immune and autoimmune disorders. This was also the case in fungal infections where immunoregulation proved to be essential in fine-tuning inflammation and uncontrolled Th1/Th2 antifungal reactivity. Recent studies have suggested a greater diversification of the CD4+ T-cell effector repertoire than that encompassed by the Th1/Th2 paradigm. Th17 cells are now thought to be a separate lineage of effector Th cells contributing to immune pathogenesis previously attributed to the Th1 lineage. Th17 cells, which produce IL-17 preferentially, promote neutrophil-mediated inflammation and, although linked to the resistance to several bacterial and parasitic infections, correlate with disease severity and immunopathology in diverse infections.

Recent evidence have shown that is the Th17 pathway—and not the uncontrolled Th1 response—

*The pathogenic role of the Th17 pathway in fungal infections: Promotion of overzealous inflammation, inhibition of protective Th1 responses, functional antagonism with regulatory T cells (Treg).*

that is associated with defective pathogen clearance, failure to resolve inflammation and to initiate protective immune responses. Both IL-17 and IL-23 inhibited the fungicidal activity and subverted the inflammatory program of neutrophils even in the presence of IFN-gamma, a finding suggesting that the Th17 effector pathway prevails over the Th1 pathway. Protective Th1 and nonprotective Th17 were crossregulated in experimental models of mucosal candidiasis or pulmonary aspergillosis. Cross-regulation occurred at different levels, including the production of directive cytokines (such as IL-12 or IL-23, for Th1 or Th17, respectively) by dendritic cells. TLR4 appeared to play a major role in controlling the balance between pro-



*Luigina Romani and Jean-Paul Latgé*

tective and protective immune responses to fungi, through its ability to both promote (via MyD88) and inhibit (via TRIF) Th17 development. This suggests that conditions of high-threat inflammation may represent a local environmental factor that predispose to Th17 activation in fungal infections. In this scenario, the unrestricted fungal growth will result from the activation of not only pathogenic Th17 cells but also nonprotective Th2 cells, whose activation is strictly dependent on fungal burden. Blockade of IL-17/IL-23 prevented pathogenic inflammatory responses, ameliorated infections and restored protective Th1 antifungal resistance, thus causally linking pathogenic inflammation to Th17 development (Zelante *et al.*, *Eur J Immunol*, 37:2695, 2007; De Luca *et al.*, *J. Immunol*, 179:5999, 2007) (Figure).

The finding that IL-23 and IL-17 promote inflammation while subverting protective antifungal immunity may serve to accommodate the paradoxical association of chronic inflammatory responses with intractable forms of fungal infections where fungal persistence occurs in the face of an ongoing inflammation. Thus, the new Th17 CD4 T-cell subset is proving to fill many gaps in our understanding of how antifungal immune responses are regulated. The new findings on the contribution of the IL-23/Th17 axis provide a molecular connection between the failure to resolve inflammation and lack of antifungal immune resistance and point to strategies for immune therapy of fungal infections and diseases that attempt to limit inflammation to stimulate an effective immune response. Immunomodulatory therapies are no longer just promising as adjuncts in the management of fungal infections but are strictly required to balance protective immunity and inflammatory pathology in fungal infections and diseases. Inhibition of the Th17 response may potentially represent such a novel strategy.

Luigina Romani



## Recurrent vulvovaginal candidiasis

Vulvovaginal candidiasis continues to be a worldwide problem with approximately 6-8% of women in their reproductive years suffering from recurrent bouts of vulvovaginal candidiasis (RVVC). There has been scant advance in understanding the pathogenesis of RVVC in the majority of patients. The dominant microorganism species responsible remains *Candida albicans* usually highly susceptible to all azoles. Less than 10 percent of isolates from women suffering from recurrent disease are non-*albicans* *Candida* species of which the dominant species is undoubtedly *C. glabrata*. The overwhelming majority of the *C. albicans* isolates are highly susceptible to all azoles including fluconazole and resistant cases are rare. In contrast, azole susceptibility is a problem with regard to *C. glabrata* vaginitis.

Some progress in understanding the pathogenesis of this complex infection has been made, particularly with regard to the final recognition of the importance of genetic host factors in determining host susceptibility. Genetic polymorphisms are now described and may explain racial and individual susceptibility to recurrent disease. In particular, mannose-binding lectin (MBL) concentrations have been found to be reduced in women with idiopathic recurrent *Candida* vaginitis and may well explain susceptibility to this infection. It should be emphasized there is widespread recognition that pathogenesis of this common entity is not simply a function of a single pathogenetic mechanism but rather that different mechanisms explain susceptibility in indi-



Jack D. Sobel

vidual women.

The management of recurrent *Candida* vaginitis has progressed in that there is now widespread acknowledgement that maintenance regimens consisting of azole suppressive prophylaxis are highly effective in controlling this condition. By control, it is meant that as long as the azole is taken either topically or orally, at an interval that is based on the unique pharmacokinetics of the individual agents, clinical manifestations are entirely absent and mycology is negative. This implies that patients are entirely free of symptoms as long as they take the suppressive regimen. These regimens are benign, entirely safe and can be taken for months and years. The breakthrough attack rate while women take these maintenance regimens is extremely low and less than seven or eight percent. In other words, the overwhelming majority of women with idiopathic recurrent *Candida* vaginitis caused by *C. albicans* can be safely controlled by long-term azole suppressive prophylaxis. Cure, however, is not readily achieved in at least half the women with this entity. Identifying those women likely

to be controlled versus those women likely to be cured, is not possible at present. Both categories of women have identical azole susceptible organisms and whether the prognosis is a function of host versus microorganism factors remains unclear. One ideally would like to achieve a patient population that is not only free of attacks off therapy, but remains either culture negative or if becoming culture positive, at least attack free in the presence of *Candida* colonization (which probably reflects the most physiologic state). New research is being directed at identifying both yeast as well as host characteristics responsible for vaginal yeast persistence.

In the meantime, control of recurrent *Candida* vaginitis caused by non-*albicans* *Candida* species is more problematic with regard to *C. glabrata*. All the other non-*albicans* *Candida* species with the exception of *C. kruseii*, which is rare, can be controlled with maintenance fluconazole enjoying an excellent prognosis on cessation of therapy. *C. glabrata*, however, is problematic in being less azole responsive and regimens that are most effective include those containing boric acid or flucytosine. Long-term maintenance programs are less available. Moreover, the major problem confronting the patients with *C. glabrata* vaginitis is identifying those women in whom *C. glabrata* is actually causing the symptoms as opposed to symptomatic women with *C. glabrata* but being of low virulence the yeast is simply an innocent bystander.

Idiopathic recurrent *Candida* vaginitis has not benefited from the new generation of available echinocandins which are not available topically or orally, as well as from the availability of voriconazole and posaconazole. We are in need of more active broad spectrum azoles which can be taken orally and preferably those with the advantages of a long half life. Nevertheless, significant progress in patient management has been accomplished.

Jack D. Sobel



# Dermatophyte infections in Europe

**D**ermatophyte fungi almost never cause serious damage to human health or threaten life of the patient. Nether the less, dermatophyte infections still affect millions, and the members of *Trichophyton*, *Microsporum* and *Epidermophyton* genera cause the most ubiquitous and the only true contagious fungal infections known today.

Extensive industry support for research on invasive fungal infections in recent years has no parallel in the field of superficial mycoses. Recognizing this, ECMM and TIMM organizing committee members have agreed to hold a special workshop to review the current state of the problem. The workshop was chaired by R. C. Summerbell and A. Y. Sergeev.

Richard Summerbell (now working in University of Toronto, Canada) opened the workshop with a review lecture on taxonomy, biology and virulence of dermatophytes in our current understanding. Prof. Summerbell discussed the impact of molecular studies on the changing concepts of dermatophyte species with relevance to pathogenesis and diagnosis of tinea infections.

Nadine Lateur (CHU Saint Pierre, Bruxelles, Belgium) gave a talk about tinea capitis in modern Europe. Dr. Lateur has outlined the importance of pan-European studies in this field, giving credit for ECMM epidemiological survey of tinea capitis in Europe, convened in 1997-1998 by R. J. Hay. The study gathered data from 92 laboratories and compared figures from 1987 and 1997. Growing numbers of cases represented by *Trichophyton* species were observed, probably representing the infections in immi-

grant communities. One of the major features of tinea capitis in Europe is diversity in predominant causative agents – zoophilic *M. canis* in Eastern and Central Europe, and anthropophilic *Trichophyton* in the West. Recent observations of Dr. Lateur on *M. langeronii* imported tinea capitis in Belgium were supported with the UK data of Prof. Hay later during TIMM, during his talk on imported non-endemic fungal infections (Workshop on travel and geographic mycology).

Alexey Y. Sergeev (I.M. Sechenov Moscow Medical Academy, Russia) provided an update topic on onychomycosis. Epidemiologic studies on onychomycosis, starting from major pan-European industry-supported Achilles project (1997-1998), were continued by different authors, contributing to the modern picture of prevalence and causative agents. Growing incidence, longer duration of disease and varying severity may describe modern onychomycosis, thus calling for selective approaches in treatment and prevention. The proportion of true dermatophyte cases of onychomycosis appears to increase when assessed with more accurate methods, e.g. with new Russian PCR probes, specific for *T. rubrum* and *T. mentagrophytes*.

Michalis Arabatzis (University of Athens, Greece), giving a talk on laboratory diagnosis of tinea infections, focused on European advances in molecular techniques. The recently published study of Dr. Arabatzis and coworkers evaluated the possibilities of multiplex real-time PCR, offering the identification of several dermatophyte species in clinical specimens in less than 24 hours. Dr. Arabatzis discussed the



highly sensitive PCR methods as new opportunities for laboratory confirmation of diagnosis for onychomycosis and other forms of tinea infection, and the probable emerging replacement of conventional diagnostic approaches.

Antonella Tosti (University of Bologna, Italy) presented an expert outline of clinical aspects of onychomycosis, explaining current challenges and pitfalls in treatment. Good initial response to modern systemic antifungals may continue with disappointing long-term results, possible relapses and reinfection. Varying clinical presentation of fungal nail infection, featuring several clinical forms, different extent of affected nail, and predisposing conditions, may contribute to therapeutic failures and recurrence. Non dermatophyte mold onychomycosis, presenting in new clinical forms, should deserve special attention and treatment. Combination therapy and special preventive measures may solve the problem of suboptimal therapeutic efficacy in such cases.

*Alexey Y. Sergeev*

*From left to right: Antonella Tosti, Alexey Sergeev, Richard Summerbell, Michalis Arabatzis, and Nadine Lateur at the workshop on Dermatophyte infections in Europe.*



3rd Trends in Medical Mycology

## Updates on uncommon and emerging fungal pathogens

**I**nvasive fungal infections in the immunocompromised population continue to be an important cause of mortality and morbidity. Several recent reports have revealed that there may be a shift in the species distribution of fungi causing these infections, in particular the non-*fumigatus* aspergilli and *Zygomycetes*. Recognizing this, a session was organized at the TIMM 2007 titled "Updates on uncommon and emerging fungal pathogens"

and was chaired by Sybren de Hoog and Kathrin Tintelnot. Four speakers presented updates on a diverse group of fungi causing human infection including black yeasts, non-*fumigatus* aspergilli, *Zygomycetes* and *Scedosporium* spp.

Montarop Sudhadham (PhD student at Centraalbureau voor Schimmeltcultures, Utrecht, The Netherlands) presented research data on ecology and routes of transmission of the black yeast *Exophiala der-*



Arun Balajee

*matitidis*, one of the major clinical black yeasts that cause occasional deaths in otherwise healthy patients. After an extensive search that included almost 3000 samples, it was concluded that the natural niche was a focal association with frugivorous animals (birds, bats) in the tropics. Also man-made niches were revealed: public steambath facilities, and railway ties in tropical climates. Two genotypes, A and B, were uncovered with Multi Locus Sequence Typing methods, which, judging from absence of mutations in rapidly evolving genes, were of a recent origin. Montarop's group showed that 2 genotypes were preponderantly found – steambaths, Genotype B or on creosote-treated wood such as railway ties Genotype A. The genotypes thus had diverged sympatrically after new, man-made niches had become available. The creosote-promoted genotype (A) is prevalently found in human disease, suggesting that assimilation of phenolic compounds might be a virulence factor.

Arun Balajee (Centers for Disease Control and Prevention, Atlanta, USA) talked about the non-*fumigatus* aspergilli causing invasive aspergillosis (IA) in solid organ and hematopoietic stem cell transplant recipients. The talk was largely based on data from a recently completed large, multicenter fungal surveillance study, Transplant Associat-

ed Infection Surveillance Network (TRANSNET). Using molecular species identification tools, her group showed that although *A. fumigatus* still remained the predominant etiological agent of IA, other unusual aspergilli - *Petromyces alliaceus*, *A. tubingensis*, *A. protuberus* (for instance) were recovered for the first time from the transplant population. Importantly, the non-*fumigatus* aspergilli such as *A. calidoustus* and *A. lentulus* that were recovered from the transplant population had high MICs to several antifungal drugs and *A. terreus* isolates had elevated MIC to the antifungal drug, Amphotericin B. In contrast, all of the *A. fumigatus* isolates had lower *in vitro* MICs to most antifungals tested. She concluded although *A. fumigatus* caused more than half of the IA in transplant settings, the non-*fumigatus* aspergilli had higher *in vitro* MICs to antifungals. However, the clinical relevance of these elevated MICs is not yet known. Notably, this large study revealed that although novel *Aspergillus* species are being reported as a cause of IA, these unusual aspergilli were rare causes of IA.

Eric Dannaoui (Institut Pasteur, Paris, France), in his presentation on "The *Zygomycetes*" pointed out that although these fungi are unusual causes of invasive fungal infections, the outcome of such infections were poor given that these organ-

isms are often angioinvasive and are resistant to several of the systemic antifungals available on the market. Significant progress has been made however, regarding the molecular taxonomy of these fungi, and data from his work showed that carbon assimilation profiles may discriminate these species. Importantly, the antifungal susceptibility profile of the species was variable between the species. Although, amphotericin B remains the most active drug, posaconazole is also active against most species both *in vitro* and *in vivo*. Dr. Dannaoui stressed the fact that clinical and microbiological surveillance programs are needed to better understand the epidemiology and biology of these organisms.

Jean-Philippe Bouchara (Angers University Hospital, Angers, France) presented work on the *Scedosporium* spp. that causes a wide variety of infections, ranging from localized infections, including in patients with cystic fibrosis, to invasive pulmonary or disseminated infections in the immunocompromised population. Thanks largely in part to the working group on *Pseudallescheria/Scedosporium* infections, the molecular taxonomy of these fungi are becoming more clear with clear evidence from multiple locus phylogeny that the *P. boydii/S. apiospermum* is a species complex. He also showed data that these fungi could be present in potted plants, therefore such plants could be possible reservoirs of infection. Data was also presented showing that azole resistance in these fungi could be due to a constitutive overexpression of genes encoding efflux pumps of the ABC protein family. Finally, Dr. Bouchara concluded that important advances in this field are expected from the development of genomic, transcriptomic and proteomic methods.

Overall, the presentations offered a snapshot of these clinically important, yet unusual organisms; as such the talks were well received with many discussions during and after the session concluded.

Arun Balajee



Maiken Cavling Arendrup

# Update on the diagnosis on invasive fungal infections

**T**he early diagnosis of invasive fungal infections is still difficult but on the same time acknowledged to be of outmost importance and with direct impact on outcome. Therefore, any news on this topic was awaited with great interest at the recent TIMM conference in Torino.

The two most common invasive fungal infections include invasive candidiasis and invasive aspergillosis. For candidiasis culture remains a cornerstone in the diagnosis but a major issue is the time needed, in average 2 days before the culture becomes positive and another 1-4 days for species identification. Over the recent years a number of reports on the development and performance of in situ hybridisation as a tool for species identification directly from the positive blood culture have been presented. At this year's TIMM this method was documented useful in a routine setting with probes targeting the five most common *Candida* species (Schønheyder H., Abstract O.04). Also noteworthy are the recently introduced rapid species identification tests which allow identification of *C. albicans*, *dubliniensis*, *glabrata*, *krusei* as soon as these are on agar plates (Lass-Flörl C., W13.1). New molecular studies allow *C. parapsilosis* to be

divided into *C. orthopsilosis* and *C. metapsilosis*, which are proposed to replace the existing designations of *C. parapsilosis* groups II and III, respectively (W13.1). Multilocus sequence typing recognized a new species of *Aspergillus*, namely *A. lentulus*, which exhibits low susceptibility to multiple antifungals *in vitro* (Balajee A., W15).

Another diagnostic approach is the non-culture based methods. For invasive aspergillosis galactomannan antigen detection has become an important and acknowledged test. Recently, several studies have shown that the test performed on BAL fluid appear to have increased sensitivity, although the cut-off for GM in BAL has not been finally defined (van Dam A.P., O.05). Also GM detections in supernatants from sliced and vortexed lung-needle biopsies have recently been shown to further increase the sensitivity. The beta-glucan detection assays, although promising (Senn L.S., O.01), have not yet been widely implemented, probably due to the higher price, more complicated set up and higher risk of contamination. A potential advantage, however, is the detection of not only *Aspergillus* but also other moulds and yeasts (with the exception of *Zygomycetes* and *Cryptococcus*).

A number of presentations focused on various in house PCR tests for detection of invasive fungal infections. In this context two major step forwards were presented at the TIMM conference: 1) the initiative on standardisation of in house PCRs (Donnelly P., White L., M9) and 2)

the development and pilot-evaluation of two new commercial PCR tests. These two include a kit for the detection of *Aspergillus & Pneumocystis* in respiratory fluids (*Myconostica*) and a kit for the detection of *Aspergillus fumigatus & the five most common Candida* species in blood (Roche SeptiFast). While the first one has been preliminary investigated in a retrospective set up using stored BAL fluids and with promising results, the second is undergoing prospective evaluation in a haematological population and preliminary results are limited but give hope for an early diagnosis (Lamoth F., O.02).

Finally, although the development of a number of new kits and tests is indeed very encouraging it is important also to focus on the daily performance in routine laboratories of clinical microbiology and mycology. Although most laboratories perform very well according to the scores obtained at external quality assessment programmes, recent Nordic experiences with a EQA programme including simulated clinical samples with zero to several microorganisms indicate that we have to focus on continued improvement and education of the staff in the routine laboratories (Meis J., Arendrup M.C., M15).

Thus all together this conference again confirms that we are moving up the ladder towards better and more rapid diagnosis of invasive fungal infections.

Maiken Cavling Arendrup  
Cornelia Lass-Flörl

# Revised definitions for invasive fungal disease



*Peter Donnelly (on the right) and Johan Maertens*

The road to hell is often paved with good intentions. This was also true of the revised definitions for invasive fungal diseases as publication was planned to coincide with this year's TIMM. However the fates decided otherwise as the manuscript was still "with the editor". None the less there was a golden opportunity to highlight why the original definitions needed revised and also introduce the salient features of the revised definitions.

First there was no change in the "Brand name" EORTC/MSG as this is not only now well known in the literature (650+ citations since 2002) but also reflects the equal participation of the Infectious Diseases

Group of the EORTC and the Mycoses Study Group of the USA. Also, proven disease still requires demonstration of fungal element by microscopy or culture in tissue. The terminology of "probable" and "possible" remains unchanged and hinges upon host factors, clinical features and mycological evidence. However what constitute a host factor has been revised -fever has disappeared from the host factors altogether whilst T-cell immune suppressants have been added. This will help expand the remit of the definitions to other patient populations. The division of clinical features into minor and major was both cumbersome and assigned equal weight to

objectively verifiable signs on CT scan and softer symptoms such as dyspnoea. Now clinical evidence primarily relies on imaging evidence of a disease process. As for mycological evidence a test for beta-D-glucan is now included but not one for PCR as yet as this technique needs first to be standardised and validated. The distinction between "probable" and "possible" diseases is now much simpler namely that

Probable IFD = Possible IFD + mycological evidence.

It was also explained why the term "invasive fungal diseases" had been adopted to emphasise that the definitions apply to fungal infections that cause illness and not those that might be confined to colonisation. Hence IFD should replace SFI, IFI and other variants.

The definitions can now apply to a wider group of immunocompromised patients than just those with cancer or who are recipients of a haematopoietic stem cell transplant. Moreover their use should help obviate confusion among clinicians especially now that patients with radiological evidence consistent with an IFD comprise effectively the only cases of "possible" mould disease. There is no more need to modify the criteria for trial purposes as happened with the "Ambiload" study (Cornely et al, *Clinical Infectious Diseases* 2007; 44:1289-97). Conversely many of the hitherto "possible" cases have been removed thereby focussing on those cases with a reasonable likelihood of being IFD for which there is no mycological evidence to support a diagnosis of "probable" IFD. It will also still be possible to compare cases classified under the old and the new definitions provided the basis for the classification is known.

It is hoped that once published researchers will find the revised definitions not only rational and clear but also useful for their research be it in studying the epidemiology of IFD, developing diagnostic tests, or in designing and conducting clinical trials of agents and strategies.

*Peter Donnelly*



**Local infection rates should guide antifungal therapy**

Staying up to date with local fungal epidemiology is becoming increasingly important, as efforts to target antifungal therapy at patients with the highest pathological, treatment-related and hospital-acquired risk of infection become more refined.

Latest data (2001-2005) from the TransNet fungal surveillance programme across 25 major US transplant centres, presented by David Warnock, from the Centers for Disease Control and Prevention, Georgia, USA, show a 12 month cumulative incidence of 1.64% for *Aspergillus*, 1.1% for *Candida*, 0.53% for other moulds and 0.3% for *Zygomycetes*. But Dr. Warnock explained that there were large variations across the 15 centres reporting solid organ transplant data and the 21 centres reporting stem cell transplant data.

The current lack of longitudinal studies of fungal infection worldwide is being addressed by a series of European surveys, preliminary results of which were reported at the congress.

First year reports from 35 Italian Intensive Care Units taking part in a major European Confederation of Medical Mycology (ECMM) study, reported by Anna Maria Tortorano from the Università degli Studi di Milano, Italy, have shown a total of 218 deep seated infections, 181 caused by yeasts and 37 by filamentous fungi. Candidaemia rates ranged from 3-23 (3-85) per 1000 patients, and from 9-26 (9-61) per 10,000 patient days. The highest rates were related to the exceptional high frequency of *C.parapsilosis* fungemia cases in two centres and are indicative of breaks in catheter care and infection control procedures. Over three quarters of yeast infections were in surgical patients, and *C.albicans* was identified in 53.5% of episodes, *C.parapsilosis* in 16.5%, and *C.glabrata* in 10.5%. Crude mortality in these cases was 36%, 33% and 69% respectively. *C.glabrata* fungemia occurred mostly in old patients, which may explain the



# Management of invasive fungal infections: remarks about

high crude mortality rate.

Infectious disease experts who attended the leading biennial congress on fungal diseases were left in no doubt that earlier intervention is the key to reducing the current significant mortality associated with fungal infection in immunocompromised patients.

'Antifungal prophylaxis should be applied to patients at high risk for invasive fungal infection, such as those with haematologic malignancies or those who have received a haematopoietic stem cell transplant, and results of prophylaxis studies should demonstrate morbidity and mortality advantages', advised Andrew Ullman from Johannes Gutenberg University of Mainz, Germany.

## Evaluating clinical trials

Comparing data from clinical trials of antifungal therapy is fraught with difficulties because of differences in study design, disease severity, planned and actually treatment duration and primary endpoints, according to speakers at a workshop devoted to clinical trial methodology.

In a review of key studies of antifungal prophylaxis in haematological malignancy, Dr Ullman discussed the problems of comparing results from studies of patients with different malignancies and severity of neutropenia. He pointed out that, while studies had demonstrated equivalence of itraconazole and fluconazole prophylaxis, and the

superiority of liposomal amphotericin B and voriconazole over placebo, a survival advantage for one treatment over another was seen in only one study, in favour of posaconazole over fluconazole/itraconazole.

Turning to bone marrow and haematopoietic stem cell transplant patients, Dr. Ullman highlighted the difficulty of interpreting data from studies of different treatment duration, ranging from 50-100 days, especially when drugs are rarely delivered as planned in the study design. He concluded that many questions remain about which patients to treat, the best use of prophylactic antifungal therapy, including optimal drug levels and duration of treatment, the potential for resistance, and the most useful endpoints.

In his discussion of studies of first line and salvage therapy for aspergillosis, Raoul Herbrecht, from the Hôpital de Hautepierre, Strasbourg, France, pointed to statistical issues, such as small numbers of patients, and interpretation of non inferiority studies as particularly challenging when analysing results. In studies of salvage therapy, he said that the most critical point is whether patients have really failed on first line treatment, and he suggested that stable disease should not necessarily be considered treatment failure.

Bart-Jan Kullberg, from Radboud University Nijmegen Medical Centre, in the Netherlands, urged

researchers to stop using non-liposomal amphotericin B as a comparator in studies of candidaemia and invasive candidosis because its toxicity is such a powerful driver of outcomes. He suggested that the optimal timing of endpoints needs more consideration and pointed out that most studies report a 70% success rate when measurements are taken at the end of treatment, but that this falls to around 40% for delayed endpoints, such as 6-8 or 12 weeks post therapy. He proposed that the best endpoint could be 2-4 weeks after treatment.

### ***Implementing guidelines in everyday practice***

Growing experience of the value of prophylactic antifungal therapy in routine clinical practice, away from the clinical trials setting, was also reported at the congress. This follows the recent publication of guidelines from the First European Conference on Infections in Leukemia (ECIL1) which stressed the importance of antifungal prophylaxis for leukaemia patients and other cancer patients undergoing haematopoietic stem cell transplant (HSCT). Helmut Ostermann, from the University of Munich Hospital, Germany, reported that none of 22 patients undergoing chemotherapy for haematological malignancy had proven invasive fungal infection (IFI), following incorporation of posaconazole antifungal prophylaxis, median duration 21 days, into the Munich regimen, and there were no deaths in the group. Three patients (17%) had a probable IFI, nine patients (41%) had a possible IFI, and 10 patients (45%) had no IFI.

This compared with a 7% proven IFI rate, 7% probable IFI, 15% possible IFI and 43% no IFI rate in a series of 100 comparable patients prior to August 2006, who did not receive posaconazole prophylaxis. There was a 14% overall mortality rate in this series, 10% being related to fungal infection. In those with proven infection, the mortality rate was 58%, compared to 12%, 15% and 5% in the probable, possible and no infection

groups respectively.

Prof. Ostermann concluded that incorporation of posaconazole prophylaxis reduced the risk of proven IFI in patients undergoing chemotherapy for haematological malignancy, and was not associated with any deaths. The lack of effect on the probable infection rate suggested possible diagnostic problems, he added.

### ***How newer antifungal agents compare***

A 33% overall response rate to caspofungin as first line therapy for invasive aspergillosis in a study of 61 haematological patients was reported by Claudio Viscoli from the University of Genova, Italy, on behalf of the EORTC Infectious Diseases Group. At day 84, 31% of patients were in complete or partial response and the survival rate was 54%. Prof. Viscoli commented that the results were comparable to those seen with other antifungal agents, in particular to the 59-71% survival rates seen in studies with lipophilic amphotericin B and voriconazole. However, he agreed with delegates that the response rate had failed to reach the 35% lower limit for a true response which had been set for the study.

Recently published results of a non-inferiority study comparing the new echinocandin, anidulafungin with fluconazole in invasive candidiasis were presented by Coleman Rotstein, from McMaster University, Hamilton, Canada. At the end of intravenous therapy, anidulafungin was statistically superior to fluconazole for clinical and microbiological response, with 75.6% of patients successfully treated with anidulafungin, compared with 60.2% in the fluconazole group. Anidulafungin was also statistically superior at the two week time point, but not at six weeks after the end of treatment. Prof. Rotstein reported that the mortality rate in the anidulafungin group was 23% compared with 31% with fluconazole and he added that, although this was not

significant, it did mean that anidulafungin had breached the 30% barrier.

### ***Revised definitions should make clinical trials easier***

Revisions to the 2002 EORTC/BAMSG definitions of invasive fungal infection are likely to be published in the next few months, and should make clinical trials simpler to perform and results easier to interpret. Plans are also underway to standardise and validate polymerase chain reaction (PCR) techniques so that these can be included in future revisions.

Broadly welcoming the new definitions as a useful framework for the diagnosis of invasive fungal infection, David Denning, from the University of Manchester, UK, suggested that some patient groups, including children, would still get left out. He predicted that antifungal prophylaxis could have an increasing impact on microbiological criteria, such as the results of bronchoalveolar lavage and aspiration tests, and he expressed reservations about the practicalities of routine galactomannan testing. He also felt that some weighting system was required to differentiate between patients with single versus multiple and repeated positive diagnostic tests, and between patients with single versus multiple invasive fungal infections.

*Jenny Bryan*

Although there are some correlations between clinical outcome and *in vitro* testing for *Candida* species, the same is not true for filamentous fungi. Recently, the CLSI has developed *in vitro* standard methods for moulds. Unfortunately, results of more than 200 tests found significant inconsistencies for the same isolate and for different species among multiple expert laboratories. Whether these *in vitro* testing is more advantageous than experimental models of infections in correlating with clinical outcome may be either drug or fungus specific. Examples follow.

Animal data support the *in vitro* efficacy of triazoles, amphotericin B and candins against *Aspergillus fumigatus*. Additionally, *in vitro* resistance of *A. fumigatus* to some drugs, mainly to itraconazole, has been confirmed *in vivo* using several animal models. Also, models using *A. terreus* confirmed the experience in humans, that this species is often resistant to amphotericin B and susceptible to caspofungin. Limited animal data support the efficacy of caspofungin against *A. flavus* while the effects of the polyene against this fungus are more uncertain.

Zygomycetes are susceptible *in vitro* and *in vivo* to amphotericin B, and are consistently resistant to voriconazole *in vitro*, in animals, and clinically. However, they have quite variable *in vitro* susceptibility to posaconazole. Animal experiments shows that the response to posaconazole therapy varies according to the pathogen. Posaconazole is generally active in infections due to *Absidia corymbifera* while the results obtained with *Rhizopus* spp. varies according to the species and the experimental procedures. *In vitro* testing of individual isolates of zygomycetes does not always predict *in vivo* or clinical responses to posaconazole. Animal data support the efficacy of the new triazoles against *Scedosporium apiospermum* but not against *S. prolificans* which is widely resistant to all antifungal agents, similarly to the clinical data. Other pathogens, such as *Fusarium*, show variation according to the species, to antifungal drug, and to



# Antifungals and filamentous fungi: *in vitro* or *in vivo* testing?



Francesco Barchiesi



John R. Graybill

immune deficiency of the host.

Endemic mycoses are also variable. With *Penicillium marneffeii* *in vitro* resistance to fluconazole and susceptibility to itraconazole are closely mirrored in clinical experience. Similarly, studies conducted in experimental models of murine histoplasmosis showed a quite good correlation among *in vitro* / animal model and human results in response to fluconazole. In particular, mouse studies confirmed *in vitro* fluconazole resistance of *H. capsulatum* and correlated with clinical failure. Interestingly, posaconazole showed some potential against fluconazole-resistance isolates of *H. capsulatum* in experimental models of systemic infections. However, clinical data on posaconazole efficacy in histoplasmosis are still scarce. Finally, *Coccidioides immitis* is susceptible *in vitro* and in animals to most antifungal drugs, but has an unpredictable tendency to clinical failure and relapses.

Why does the *in vitro* test corre-

late well with animal and clinical results for some species and poorly with others? There are multiple potential reasons, none of which are universally applicable. First, many of these organisms cause tissue infarcts by angioinvasion. Necrotic tissue is not penetrated well by any antifungal. Second, pharmacokinetics and pharmacodynamics differ widely among drugs and among animal species. For example, voriconazole clears so rapidly in mice that *in vivo* results are unreliable. Third, *in vitro* testing of conidia has in some hands given difference results from tests of hyphae. Finally, Growth rates and nutritional requirements (i.e. zygomycetes for acid and iron and sugar) may differ widely among filamentous pathogens. One size does not fit all.

Francesco Barchiesi

John R. Graybill



# Cryptococcal Working Group 1

## The first ISHAM sponsored symposium at the TIMM3

ISHAM sponsored a symposium organized by the Cryptococcal Working Group 1 for the TIMM3 meeting in Torino. This was the first Working Group symposium sponsored by ISHAM since the various working groups were established in 2006-2007 under the umbrella of ISHAM.

The Cryptococcal Working Group 1 “Genotyping of *Cryptococcus neoformans* and *C. gattii*” was formed in 2006 in order to bring together investigators interested in cryptococcal epidemiology and population genetics and to standardize the molecular strain typing methods that can be applied universally. In addition, the working group aimed to foster the genotypic analysis of cryptococcal strains from the geographic regions where cryptococcal population genetics has been less studied such as the Middle East, Eastern Europe, Scandinavia and the Far East.

The symposium of the Cryptococcal Working Group 1 entitled “World-wide genotypic status of the agents of cryptococcosis: Is the cryptococcal genotype related to epidemiology?” included six presentations:

- 1 Clonal population of Chinese *Cryptococcus neoformans* strains cause infection predominantly in patients without any apparent risk factors (J. Kwon-Chung),
- 2 Cryptococcal genotype in the Caribbean region with special interest to Cuba (G. Martinez),
- 3 Genetic complexity of *C. gattii* from S.E Asia and North America (W. Meyer),
- 4 Structure of sensu lato, with special reference to *C. gattii* (T. Boekhout),
- 5 Developing MLST.net as a tool for mapping the global biodiversity of *Cryptococcus* (M. Fisher),



June Kwon-Chung

- 6 Overall picture of European *C. neoformans* strains and future direction of genotyping (M.A. Viviani).

The symposium was well attended with lively discussions at the end of the symposium.

The most important achievement of the Cryptococcal Working Group 1, in addition to the symposium, at TIMM3 was the meeting among members of the working group in order to arrive at a consensus on the issues associated with the nomenclature and the genotyping methods that can be applied universally. The highlights of those discussions are summarized as follows:

- A. The working group has agreed to choose nomenclature of genotype, VNI (serotype A), VNII (serotype A), VNIII (serotype AD) and VNIV (serotype D) for *C. neoformans* and VGI (serotype B), VGII (serotype B), VGIII (serotype B) and VGIV (serotype C) for *C. gattii* that were coined by W. Meyer according to the M-13 PCR pattern. This agreement was based on the fact that the nomenclature

correlates with the current status of the two species concept in cryptococcosis etiology. The VN-VG nomenclatural system also represents the global population structure based on the analysis of more than 2000 isolates.

- B. The working group also agreed to designate reference strains: In addition to Meyer's standard strains for each type, H99 and B-3501 were suggested as the alternative reference strains of VNI and VNIV respectively since their genomes have been sequenced.
- C. The reference strains are to be deposited at both CBS and ATCC for easy access by anyone interested.
- D. For the MLST (multilocus sequence type), 7 genes, *CAP59*, *GPDI*, *IGSI*, *LACI*, *PLBI*, *SODI*, *URA5*, were chosen based on the results obtained in the studies by several investigators with special emphasis on the number of different sequence types. The 7 genes can be PCR amplified using the same primers for all 8 major molecular types within the two species of cryptococcosis agents. The database of MLST can be found at [www.mlst.net](http://www.mlst.net). The details of PCR conditions for MLST will be posted in the Cryptococcal Working Group 1 page in the ISHAM website.

Investigators who are interested in joining the Cryptococcal Working Group 1 are encouraged to contact June Kwon-Chung ([june\\_kwon-chung@nih.gov](mailto:june_kwon-chung@nih.gov)), the chair of the Cryptococcal Working Group 1 or Malcolm Richardson ([malcolm.richardson@helsinki.fi](mailto:malcolm.richardson@helsinki.fi)), the general secretary of ISHAM.

K. June Kwon-Chung

# How the fungal genome project may have helped to solve one of the mysteries of history

## *Arsenic poisoning and the role of environmental moulds*

One of the plenary lectures during the recent TIMM meeting in Turin was given by David Denning (University Hospital of South Manchester, and the University of Manchester), entitled 'The fungal genome project: where are we headed?' The lecture covered a variety of topics including: Which fungi are sequenced? The genomes of *Aspergilli*, the availability of genome resources; and the future of genomic sequencing of fungi. Prof. Denning pointed out that most of the 500 or so *A.fumigatus*-specific genes (relative to *A.oryzae* and *A.nidulans*) have no functional annotation. Some do, however, and the most interesting examples include two putative members of the ArsC-superfamily arsenate-detoxifying arsenate reductases found in bacteria.

The evolution of our understanding of arsenic poisoning and the role of environmental moulds is fascinating as it appears from the information provided by Prof. Denning. Previous observations correlating the dangers of toxic arsenic concentrations in pigments of fabrics and wallpapers were recognised and investigated during the 18th century. Documented causes of arsenical poisoning have included traditional Chinese herbal balls, Korean herbal medicine prescribed for haemorrhoids, kelp supplements, contact with pesticides and rodenticides, industrial waste contaminations in water streams, beer, milk, rice, arsenic-treated pressurised lumber, cocaine and 'sinister forensic events'. In the 19th century there were reports of poisonings associated with green pigments in fabrics and wall coverings (Scheele's green). In 1892 Bartolomew Gosio, an Italian physician, found certain fungi could metabolize arsenic pigments producing toxic trimethylarsine (Gosio gas).

A screen in the 1930s by Thom and Raper found *A.fumigatus* to one of a small number of arsenic fungi. Arsenic compounds have been abundant at near toxic levels in the environment since the origin of life. A tragic example of this is cot deaths. Cot deaths have been attributed to biodeterioration of cot mattresses by extracellular enzymes of *Scopulariopsis brevicaulis* converting preservative plasticisers and fire retardants to arsine and phosphines.

## *What does this have to do with Napoleon I?*

During his research Bartolomew Gosio discovered that arsine was released by the action of fungus *Penicillium brevicaulis* on arsenical wallpaper pigments. Reddish pigmented colours had the highest arsenic content. The later use of white arsenic in the horse-hoof sizing used in wallpaper hanging discouraged rodent damage, but increased the dangers! Little wonder that many victims improved from their variegated symptoms after being sent away to the country for a change of scene and air. Renovation of century-old houses is a well-documented source of lead and arsenic poisoning. In addition to *Penicillium* species, other moulds such as *A.fumigatus* and *A.niger* have been isolated behind odorous and moist wallpaper. The spectrum of signs and symptoms of arsenic intoxication include torsade de pointes with circulatory collapse, polyneuropathy with Landry Guillain Barré syndrome, encephalopathy with seizure states, enteritis, myelodysplastic syndrome, vasospastic events with acrocyanosis, hyperpigmented keratoses with skin neoplasia, rhabdomyolysis, renal failure to hepatic necrosis, progressing to veno-occlusive fibrosis.

In 1815, after being defeated by the Duke of Wellington at the Battle of Waterloo, Napoleon Bonaparte was exiled to the tiny and remote volcanic island of St Helena in the south Atlantic. During most of his exile, Napoleon lived in Longwood House with a retinue of about twenty people. A number of these had a motive to murder

Napoleon. The Emperor died at Longwood House in 1821. A few days prior to his death Napoleon had requested that his doctor make a full examination of his body, particularly of his stomach. The doctors who carried out the post-mortem on Napoleon said that a perforated stomach ulcer that had turned cancerous was the main cause of his death. Initially Napoleon was buried on St Helena but his body was later removed and re-buried in Paris at the Invalides.

## Was Napoleon poisoned? By whom? By what?

In 1952 Swedish dentist Sten Forshufvud read the recently published account of Napoleon's death by Merchand. Based on his knowledge of toxicology, Forshufvud came to the conclusion that Napoleon had been murdered. Fortunately, a number of Napoleon's staff had kept locks of the Emperor's hair, which were passed down the generations, sometimes coming up for auction. In the 1960s this happened and in order to prove this theory Forshufvud turned to Glasgow University forensic scientist Professor Hamilton Smith, who had developed the nuclear techniques to record very small levels of arsenic. Using these techniques it was shown that small quantities of arsenic were present in Napoleon's hair. It was possible to poison a person without detection by slowly exposing him/her to small quantities of arsenic. This technique was known and was described in a book that one of Napoleon's staff, Albine de Montholon, Napoleon's supposed mistress, had with her on St Helena. Forshufvud concluded that Napoleon had been murdered by the Comte de Montholon, his head of staff and Albine's husband.

However, in 1980, a Dr David Jones made a radio programme, broadcast by the BBC, in which he asked if anyone knew the colour of Napoleon's wallpaper on St Helena. As part of the programme, one of the stories that Dr Jones had told was one about Gosio's Disease and Scheele's green. If Napoleon's wallpaper had been green, it could possibly have contained arsenic, and this could have been the source of the arsenic in the hair sample. Napoleon might have been an early victim of Gosio's disease. Shirley Bradley who lived in Norfolk, England, had a piece of the wallpaper itself. The wallpaper showed a single star, the principal of which were green and brown although it is possible that the brown had faded, and had originally been gold. Gold and green were the Imperial colours. The green pigment did contain arsenic and it began to look as if Napoleon might have been a victim of Gosio's disease, poisoned not by the British authorities, but inadvertently by the British wallpaper makers. Many of the other people who were with Napoleon on St Helena also became ill and complained of the 'bad air'. Napoleon's butler did actually die. Dr Jones' conclusion was that the amount of arsenic in Napoleon's wallpaper was not particularly great and consequently the amount of arsenic vapour in the air would not have been large, otherwise more people would have become sick or died. Although the arsenic was not enough to have killed Napoleon, once he was already ill with a stomach ulcer, the arsenic would have exacerbated his condition. Certainly some of the symptoms he complained about do correspond to those of arsenic poisoning.

## *In conclusion*

As we learnt from Prof. Denning the genes found in the *A.fumigatus* genome include those conferring arsenic resistance in *A.fumigatus* and upregulation of arsenate reduction which may be responsible for the hypertolerance of this fungus to arsenic. So, the intriguing question remains: did Napoleon developed arsenic poisoning because of fungal, possibly *Aspergillus*, growth on the wallpaper?

Malcolm Richardson



# The ECMM Young Investigators Travel Award

*Ferry Hagen from CBS Fungal Biodiversity Centre (Utrecht, The Netherlands), was awarded the 2007 ECMM Young Investigators Travel Award.*

Since December 2006, I am working at the CBS Fungal Biodiversity Centre (Utrecht, The Netherlands) as a PhD student in the Yeast Research group headed by Teun Boekhout. Before I started with this PhD research project, I worked for five years in this research group as a technician in the yeast and molecular laboratory studying the epidemiology of *Cryptococcus neoformans* in the Netherlands and the ongoing outbreak of *Cryptococcus gattii* on Vancouver Island.

I was completely surprised by the fact that the board of ECMM awarded me, during the Trends in Medical Mycology meeting in Torino, the Young Investigator Travel Award. It is a great honor for me that our poster,

entitled 'Where is the origin of the *Cryptococcus gattii* Vancouver Island outbreak?' (authors: Ferry Hagen, Eiko E. Kuramae, Marjan Bovers, Dave J.C. Gerits, Collin H.A. Gerritzen, Wieland Meyer and Teun Boekhout) won this important prize. This award is an extra stimulant for me, and our "*Cryptococcus* team", to further investigate the epidemiology and genetics behind the ongoing outbreak of this pathogenic fungus.

Since 2002, our research team is working together with several investigators worldwide to find the answers on several questions regarding the ongoing outbreak of *C.gattii* on Vancouver Island and the mainland of British Columbia (Canada). The title of our poster addresses one of the most debated questions in current *Cryptococcus* research. Other researchers concluded that this outbreak was caused by a same-sex mating between two Australian low virulent *C.gattii* strains. We have used a plethora of molecular tools to prove this hypothesis, but came to the conclusion that not Australia but most likely the warm environment of Northern South America is the cradle of this outbreak.

During the past years, it became apparent that there was an increase in case reports describing *C.gattii* and atypical *C.neoformans* infections in European citizens. This prompted us early 2006 to start, in collaboration with the ECMM *Cryptococcus* and cryptococcosis working group, an epidemiological study to investigate the genotypic, phenotypic and clinical characteristics of these *Cryptococcus* strains. This will be another project on which I will work during the coming years, as well as on the finalization of the epidemiology of Dutch cryptococcosis.



*Ferry Hagen and Roxana Vitale, the winner of the 2000 ECMM Young Investigators Travel Award.*

*Ferry Hagen*

## Report on...

## FunNet2007

## Focussing and coordinating European research on human pathogenic fungi

*The first joint meeting of research consortia on fungal pathogens in Europe*

Infections with human pathogenic fungi, in particular *Candida* species and *Aspergillus fumigatus*, are increasing, and yet their biomedical significance is still thought to be underestimated. *Candida* species frequently cause superficial infections of mucosa and skin. However, in hospital settings, particularly in intensive care units, these fungi are life-threatening and prevalent. *Candida* infections account for the third most common type of hospital-acquired infections in the USA, after *Staphylococcus epidermidis* and *S.aureus* infections, reaching mortality rates of more than 50%, which are higher than those caused by bacterial pathogens such as *Pseudomonas aeruginosa*. Even more dramatic are mortalities from systemic infections with *A.fumigatus* (up to 90%).

The biomedical importance of fungal infections has recently been recognised by several research groups in Europe. Their projects are supported by different transnational programmes of the European Commission and national science foundations. Some nine European networks focussing on molecular medical mycology and the training of young researchers have been established during the 6th framework programme and the ERANet-PathoGenomics scheme. Delegates and PhD students of these networks gathered, for the first time, in a joint meeting (FunNet2007 – Fungal Pathogen Networks) in Gosau, Austria, organised by Karl Kuchler (Medical University of Vienna). In addition to the scientific exchange and management meetings of consortia, the networks discussed their visions and strategies together in a joint FunNet2007 Workshop. This FunNet2007 workshop was sparked by an earlier 'White Paper on Fungal Pathogens', which was written in 2006 by Alistair Brown (Aberdeen University, UK) together with eminent scientists in the field.

FunNet2007 concluded that a major aim of fungal pathogen networks should be to increase the quality, reliability, accuracy and efficiency of both clinical diagnoses and therapy of life-threatening fungal diseases. It will also be crucial to elucidate pathogenicity mechanisms driving fungal infections, in particular the mechanisms triggering transition from commensal growth to parasitic and systemic dissemination. The collaborative efforts of microbiologists, clinicians and immunologists will be necessary, to shed light on host responses, as well as on the pathogenic mechanisms allowing for host invasion. Systematic approaches as well as systems biology approaches will be required. In addition, improved and widely available tool boxes need to be generated (i.e. genome-wide mutant libraries, antibodies, animal models, vaccines), as alongside methodological standardization. Also, the training of young researchers in the most advanced technologies (eg post-genomics, cell microbiology, immunology) that are all relevant to medical and molecular mycology is essential. During FunNet2007, delegates from

different networks strongly highlighted the need for interdisciplinary approaches, the integration of other fungal pathogens (*Cryptococcus*, *Fusarium*, *Trichophyton*), and the development of novel animal infection models (including those enabling dissection of commensalism). More effective communication with hospitals is also required, as well as biobanks with clinical isolates, and cooperation with pharmaceutical industry and clinicians. FunNet2007 concluded that these urgent needs have not been met in FP7 as yet, and they should be included as relevant topics in upcoming FP7 thematic calls.

European research networks with research topics on human pathogenic fungi and their internet homepages are listed below for further information. These homepages will provide a downloadable and updated 'White Paper on Fungal Pathogen Research' in Europe, in which future visions, needs and strategies will be described in more detail, in spring 2008.

Bernhard Hube

FunPath	<a href="http://www.pathogenomics-era.net/projects">www.pathogenomics-era.net/projects</a>
CanTrain	<a href="http://www.cantrain.be">www.cantrain.be</a>
Galar Fungail II	<a href="http://www.galarfungail.org">www.galarfungail.org</a>
FungWall	<a href="http://www.fungwall.org">www.fungwall.org</a>
EURESFUN	<a href="http://www.chuv.ch/imul/euresfun">www.chuv.ch/imul/euresfun</a>
Glycoshield	<a href="http://www.pathogenomics-era.net/projects">www.pathogenomics-era.net/projects</a>
KinCan	<a href="http://www.pathogenomics-era.net/projects">www.pathogenomics-era.net/projects</a>
Manasp	<a href="http://www.manasp.org">www.manasp.org</a>
SignalPath	<a href="http://cogeme.ex.ac.uk/signalpath/">http://cogeme.ex.ac.uk/signalpath/</a>



# 2<sup>nd</sup> Pan African Medical Mycology Society Conference

The second PAMMS Conference was held in Cape Town, 6-8 May 2007, at the Cape Town International Convention Centre (CTICC) and provided medical mycologists from Africa with a unique opportunity to present their latest research findings, to foster collaboration and to establish long-term relations between scientists from Africa and abroad. Sixty scientists, most of them from Africa, participated and included several eminent medical mycologists from elsewhere presenting their work done in Africa. African countries that were represented included South Africa, Nigeria, Cameroon, Sudan, Egypt and Kenya, while there were also delegates from the USA, Australia, The Netherlands, Germany, Qatar, Saudi Arabia, India, Denmark, France and Austria present.

It was the privilege of the PAMMS 2007 Organising Committee consisting of Hester Vismer (Chairperson), Estella Burgess/Belinda Lategan (Treasurers) and members Sybren de Hoog, Lorraine Moses, John Rheeder, Gail Imrie and Theo Leukes, to financially support 14 scientists from Africa to attend the conference. The main sponsor of the event was the International Society for Human and Animal Mycology (ISHAM), while European Confederation of Medical Mycology (ECMM) and the Africa Fund for Fungal Biodiversity and Mycotic Infections also substantially contributed to the fi-

ancial support. These sponsorships also allowed the organisers to waive the registration fees of all the speakers. Many students who either completed a post graduate degree, or were in the process of completing such a degree and residing in countries in Africa, presented their research findings in oral and or poster presentations.

A wide variety of mycological topics was presented. These ranged from rare clinical cases in HIV/AIDS subjects; the evaluation and potential of plant extracts as anti-fungal agents and their practical application in Africa; the natural habitats, molecular analyses and epidemiology





Sessions at the PAMMS 2007 Conference were well attended

of *Cryptococcus* species and the implication of the provision of antiretroviral therapy in AIDS patients with cryptococcosis (currently in Southern Africa the impact and death rate of cryptococcosis in HIV/AIDS remains extremely high); the occurrence and incidence of mycetoma in Africa, and the molecular identification of mycetoma causing agents; dermatophytes; barcoding of fungi, eg. black yeasts; as well as several other topics such as sporotrichosis, histoplasmosis, aspergillosis and mycotic diseases caused by less well-known fungi. As with the first meeting, this conference showed that Africa has much to offer in medical mycology, both clinically and scientifically, and once again accentuated the fact that health problems in Africa are still enormous.

A PAMMS General Meeting was held during the conference and the first official council of the society was elected. Dr. Hester Vismer (South Africa) was elected as President, Prof. Ifeoma Enweani (Nigeria) as Vice-President, Dr. John Rheeder (South Africa) as Secretary, and Prof. Alf Botha (South Africa), Dr. Abdalla Ahmed (Saudi Arabia) and Dr. Ahmad Moharram (Egypt) as members of the council. An International Advisory Committee will be constituted by the council in due course. A constitution for the

society was drafted by Hester Vismer and will be scrutinized by the council and presented at the next general meeting of the PAMMS for acceptance. The next meeting



Ms Lorraine Moses receiving her book prize sponsored by Sigma Aldrich for the best poster at PAMMS 2007



Mr Palanisamy Manikandan (centre) receiving his poster award from Prof Sybren de Hoog (left) and Dr Jacques Meis (right)

will be held in two or three years time in Nigeria with Ifeoma Enweani as the chairperson.

No less than five poster awards were presented after a panel of six judges evaluated the posters. Sigma Aldrich sponsored a book prize that went to Ms. Lorraine Moses for her poster entitled "Molecular analyses to determine the reproductive mode of *Fusarium globosum*", the second poster prize of the Clinical Atlas of Clinical Fungi (CD), sponsored by the Medical Research Council of South Africa, was awarded to Mr. Palanisamy Manikandan for his poster on "Neocosmospora vasinflecta keratitis". Three one year membership subscriptions to ISHAM was awarded to Dr. Marie-Pierre Hayette, Dr. Pyu Pyu Sein and Ms. Euphemia Sekati for their poster presentations. The council hope to retain this tradition at future meetings of the PAMMS.

The abstracts of oral presentations and posters of the 2nd PAMMS Conference can be viewed at [www.cbs.knaw.nl](http://www.cbs.knaw.nl). There is a limited number of hard copies of the proceedings available to residents in Africa, which can be obtained for free from Hester Vismer at [hester.vismer@mrc.ac.za](mailto:hester.vismer@mrc.ac.za).

Application for membership can also be made to this e-mail address. Membership of the PAMMS is currently free, as the Africa Fund for Fungal Biodiversity and Mycotic Infections (Africa Fund), initiated by Sybren de Hoog and Jacques Meis of the Netherlands, will cover the initial costs of the Society. The Africa Fund has limited resources for training of African students in Europe; applications may be sent to [de.hoog@cbs.knaw.nl](mailto:de.hoog@cbs.knaw.nl).

Hester Vismer  
PAMMS President



# IUMS 2008 ISTANBUL

## Meetings of the Divisions of the International Union of Microbiological Societies 2008

The International Union of Microbiological Societies (IUMS) has three Divisions – Bacteriology and Applied Microbiology (BAM), Mycology, and Virology – which come together every three years for the organisation of their international congresses. In 2005, the American Society for Microbiology hosted these congresses in San Francisco. The IUMS Congresses 2008 will be hosted in Istanbul, Turkey, by the Turkish Microbiological Society, the Society of Microbial Ecology and the Society of Chemotherapy. The Mycology and the BAM Divisions will held their meetings jointly from 5 to 9 August, followed by the Virology Division Congress from 10 to 15 August.

The IUMS Mycology program, organised in the format of plenary, symposium, and poster sessions, will cover a variety of topics, which reflects the numerous interests of mycologists. Sessions will address taxonomy and biodiversity, medical and environmental mycology

and the impact of molecular biology, fungal resistance to various antifungal agents and population genetics.

Generally, IUMS Congresses do not have strong attendance from mycology scientists, who are well attracted by more specific conferences. However, in the era of hyper-specialisation it is often prudent to look at yeasts or moulds in the overall context of microbiology, and see how they relate to bacteria and viruses. These microorganisms share many common bio-physiological characteristics and it should not be forgotten that in natural habitats they live together and actively interact. The IUMS Congresses provide an excellent opportunity to explore the broader view and see new directions.

Although there are nominated topics for symposium sessions, mycologists are invited to submit papers for oral presentation on any topics relevant to the Congress. Every effort will be made to accommodate these in the final program.

## XII International Congress of Mycology

### LECTURES

<i>Opening Lecture</i>	P. Crous (NL)	Fungal biodiversity: the future of research
<i>Keynote Lecture</i>	B.J. Howlett (AU)	Mechanisms of fungal pathogenesis in plants and animals

### PLENARY SESSIONS

Mycotoxins and mycotoxigenic fungi  
 Future directions for yeasts in food and beverage production (ICFM & ICY) .  
 Fungal biofilm: the new frontier  
 Controversies and progressions in antifungal management and susceptibility testing

### CHAIRS

A. Visconti (IT), J.F. Lesile (USA)  
 P. Romano (IT), G. Fleet (AU)  
 M. Ghannoum (USA), J.P. Latgé (FR)  
 S. Arıkan (TR)

### SYMPOSIA

Indoor environments in the Mediterranean countries (ICIF)  
 Progress in the phylogeny of fungi: one gene, four genes, genomes  
 Applied fungal genomics (ICBB)  
 Facing the transition from culture collection to biological resource centre  
 Advances in molecular phylogenetic/systematics of *Penicillium* & *Aspergillus*  
 Fungal secretome  
 ISHAM WG: Black Yeasts: life on the extreme  
 Food Mycology (ICFM)  
 ECMM WG: Invasive fungal infections in the intensive care  
 Mycoses in wildlife  
 ECMM WG: Zygomycosis  
 Emerging fungal plant pathogens  
 Advances in molecular subtyping of pathogenic fungi (ICAMD)  
 Fungal infections in developing countries  
 Taxonomic development of economically important fungal genera  
 Yeasts and the environment (ICY)

### CHAIRS

O. Adan (NL), T. Warscheid (DE)  
 M. Blackwell (USA)  
 J. Bennet (USA), M. Machida (JP)  
 D. Smith (UK), H. Sugawara (JP)  
 S. Peterson (USA), J. Varga (NL)  
 L. Lange (DK), S. Baker (USA)  
 S. de Hoog (NL), L. Selbmann (IT)  
 G. Fleet (AU), R. Samson (NL)  
 J. Meis (NL), L. Klingspor (SE)  
 J. Guillot (FR), A. Ilgaz (TR)  
 G. Petrikos (GR), E. Tümbay (TR)  
 P. Crous (NL), B.J. Howlett (AU)  
 D. Stevens (USA), S. Bretagne (FR)  
 J. Kwon-Chung (USA), T. Harrison (UK)  
 I. Druzhinina (AT), R. Samson (NL)  
 L.C. Mendonca-Hagler (BR), N. Arneborg (DK)

### Programme Committee

*Chair* Marianna Viviani (Italy), *Vice-Chair* Emel Tümbay (Turkey)

*International Advisory Board:* S. Arıkan (TR), J. Bennett (USA), M. Blackwell (USA), P. Crous (NL), S. de Hoog (NL), G. Fleet (AU), M. Ghannoum (USA), J. Guillot (FR), A. Hocking (AU), J. Kwon-Chung (USA), L. Lange (DK), J. Meis (NL), L.C. Mendonca-Hagler (BR), E. Reiss (USA), E. Roilides (GR), P. Romano (IT), R. Samson (NL), J. Taylor (USA), A. Visconti (IT)

Deadline for submission of abstracts  
January 31, 2008

Registration deadline at reduced fee  
April 1, 2008

For further information  
[www.iums2008.org](http://www.iums2008.org)



## XII International Congress of Bacteriology and Applied Microbiology

### LECTURES

<i>Opening Lecture</i>	R. Losick (USA)	Surprises in how bacteria cope with uncertainty
<i>Closing Lecture</i>	P. Bork (DE)	Comparative genomics
<i>Closing Lecture</i>	P. Sansonetti (FR)	Pathogenicity

### SATELLITE SYMPOSIUM

Vaccine

### CHAIRS

K.P. Klugman (USA)

### PLENARY SESSIONS

Omics and pathogenicity (Pathogenomics)  
Regulation of gene expression  
Chaperones, trafficking, protein secretion  
White biotechnology/Metabolic engineering  
Antibiotics /Pathogenicity  
Taxonomy of prokaryotes  
From metabolism to metabolic networks  
Interactions in the microbial world (ISME)

### CHAIRS

P. Sansonetti (FR)  
J. Helmann (USA)  
J. Wehland (DE)  
H. Sahm (DE)  
J. Davies (CA)  
J.T. Staley (USA), K.H. Schleifer (DE)  
  
S. Kjelleberg (AU)

### SYMPOSIA

Pathogenicity and Commensalism  
Stress/Starvation responses/Global regulatory networks  
Plant-Microbe-Interaction  
Extremophiles  
Bacterial metabolism (VAAM Session)  
Nosocomial infections  
Signal transduction  
Bacterial protein secretion related to health and disease  
Cellular microbiology  
Functional genomics/Pathogenomics  
Antibiotic resistance  
Food-born bacterial infections/ Food microbiology  
Systematics: The objects and objectives of classification  
Bacterial multicellular behaviour and biofilm formation  
Metagenomics  
Physiological proteomics: from blueprint to real life  
Systems microbiology  
White microbiology  
Anaerobic life  
Emerging/reemerging bacterial infections  
Actinobacteria: an unexhausted source for biodiscovery, biotechnology and biobusiness

### CHAIRS

J. Hacker (DE)  
C. Harwood (UK)  
L. Eberl (CH)  
M. da Costa (PT)  
B. Schink (GR)  
H. Abacioğlu (TR)  
U. Roemling (SE)  
J.M. van Dijl (NL)  
J. Wehland (DE)  
C. Buchrieser (FR)  
P. Courvalin (FR)  
  
B.J. Tindall (DE)  
  
W. Liebl (DE)  
G. Özcengiz (TR)  
  
S. Olof (SE)  
B. Schink (DE)  
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## ISHAM: medical mycology alive!

One of the main and most active organizations promoting all aspects of medical and veterinary mycology on a global scale is ISHAM (International Society of Human and Animal Mycology). Membership of this Society certainly is mandatory for every ambitious medical mycologist worldwide. We have set up very efficient, interactive communication tools. Our latest service is an electronic alerting system for global advice on urgent diagnostic and therapeutic challenges, called 'ISHAM-SOS!' Interesting and educational cases will subsequently be published in 'Medical Mycology', the society journal with an increasing impact factor and the spectacularly low average turnaround time of only 50 days.

A major development within ISHAM is the establishment of Working Groups on particular themes. At this moment seventeen topics are covered. The WGs are networks of specialists and other researchers interested in and working on the themes selected. Plans and news items from the Working Groups can be found on the ISHAM website, click at <http://www.isham.org/Groups.asp>. Several have established their own websites, which you can find easily through the respective links. ISHAM provides facilities and gives financial support to their activities, a.o. in the form of sponsorship of workshops. Several workshops have already taken place, e.g. on *Aspergillus*, black yeasts, chromoblastomycosis, and on *Scedosporium*, while a subsequent WG meeting will be on sinusitis,

next February in India. All workshops held thus far have proven to be incredibly successful, leading to books and special issues of several journals. We also support some major congresses, such as Advances Against Aspergillosis (see <http://www.aaa2008.org/>).

If you wish to join any of ISHAM's activities, or if you wish to be informed about developments in medical mycology, you are more than welcome as a member of our Society.

Just click [http://www.isham.org/membership\\_form.asp](http://www.isham.org/membership_form.asp) for a membership form. Subscription to 'Medical Mycology', discussion fora and alerting systems are included in the fee. Memberships of Working Groups are free of charge.

*Sybren de Hoog*  
ISHAM President

### IUMS 2008 Istanbul

#### ISHAM Working Group On Black Yeasts: Life on the extreme

(Parallel Symposium 7)

Thursday 7 August 2008, h. 16.00 - 18.00

Chair S. de Hoog (NL)  
Co-chair L. Selbmann (IT)

F. Lutzoni (USA)	Origin of extremotolerance, in black yeasts
L. Selbmann (IT)	Fungal life inside rocks of Antarctic dry deserts
H. Badali (NL)	Agents of chromoblastomycosis: a link between extremotolerance and human pathogenicity?
W. Boeger, (BR)	New diseases in crabs promoted by climatic change

Black yeasts are very remarkable in their ecological preferences: they love the extreme. We are now beginning to understand that we can uncover a wealth of diversity by using exceptional isolation methods, such as crushing bare rock, using toxins, pure sulphuric acid, or high temperature – or human bodies. Some of the evolutionary lines leading to human and animal pathogenicity have our special attention. Saprobic black yeasts may suddenly express their pathogenic potential under the influence of global change, as is demonstrated in an emerging crab disease at the Brazilian coast.



# Workshop on fungal sinusitis

The International Society for Human & Animal Mycology has formed a working group on 'Fungal sinusitis'. The working group with its website (<http://fungalsinusitis-group.org>) was launched in May 2007, with membership open to all the workers working actively in the field of fungal sinusitis. The highlight of the group is that it will serve as a meeting ground for the members and that it serves as a portal for exchange of ideas and to keep the members abreast about the latest developments taking place in the area of fungal sinusitis.

With those objectives in mind a workshop is being organized at Chandigarh, India during 9th-11th February, 2008. "The City Beautiful Chandigarh", which is located approximately 160 miles/250kms North West of New Delhi, is situated at the foothills (the Shivalik

mountain range) of the majestic Himalayas. The workshop will be held at Hotel Mountview, a beautiful hotel with country look.

Two days of intensive scientific deliberations, and symposia are planned to cover all areas in fungal sinusitis. There would be no registration fees for the workshop. However participants must have a keen interest in the areas of fungal sinusitis. To express his or her interest every participant other than invited speaker must present a poster in the area of fungal sinusitis. To encourage the participation in the workshop meals, tea and snacks will be served on behalf of the organizers.

*Arunaloke Chakrabarti*

*Co-ordinator, WG on 'Fungal sinusitis'*

## Scientific program

Sunday 10 February, h 8:30 am – 6:30pm

### Symposium 1: *Magnitude of the problem*

D. Denning (UK)	Prevalence of fungal sinusitis A global perspective
A. Chakrabarti (India)	Prevalence of fungal sinusitis Indian perspective
A. Gupta (India)	Fungal sinusitis Experience in pediatric patients
A. Fothergill (USA)	Spectrum of agents causing fungal sinusitis

### Symposium 2: *Categorization of fungal sinusitis*

H. Stammberger (AT)	Controversies surrounding Terminology and Categorization
A. Das (USA)	Histopathologists can categorize fungal sinusitis better
M. Richardson (FI)	Role of CT in diagnosis
P. Singh (India)	Role of MRI in diagnosis
B. Marple (USA)	Definition of AFRS
B.J. Ferguson (USA)	Concept of EFRS
J. Ponikau (USA)	Role of fungi in CRS – Alternate concept
H. Kita (USA)	Use of animal model in understanding fungal sinusitis

### Symposium 3: *Allergic fungal sinusitis*

W. Buzina (AT)	Fungi - allergen or a bystander in AFRS?
S. Vlamincx (BE)	The finding of hyphae in sinuses, its significance
H. Kita (USA)	Novel biomarkers and newer diagnostic techniques for fungal sinusitis
E. Toskala (FI)	Role of MMPs in CRS The missing link between fungal exposure & eosinophilic inflammation

R. Vedantam (India)	Increasing diagnostic yield in allergic fungal sinusitis – a surgeon's perspective
H. Stammberger (AT)	Surgical Management of EFRS
B. Marple (USA)	Treatment of CRS in light of classification as EMRS
J. Ponikau (USA)	The role of antifungals in the treatment of CRS

Monday 11 February, h 8:30 am – 6:30pm

### Symposium 4: *Colonizing fungal ball*

	Colonization of fungi in sinuses Its significance
C. Kauffmann-Lacroix (FR)	Epidemiology. Do fungi discriminate patients or do patient discriminate fungi?
Handa (India)	Diagnosis and management
Thungapatra (India)	Genetic risk factor analysis / Microarrays - is it the way to the future?

### Symposium 5: *The Invasive Disease*

T. Aldeen (Qatar)	Agents responsible for invasive disease
S. Kantarcioglu (TR)	Diagnosis of invasive disease
N. Panda (India)	Management of invasive disease

### Panel Discussions: *To resolve the controversies and define each category of fungal sinusitis*

H. Stammberger, W. Buzina, J. Ponikau, B. Marple, B.J. Ferguson, A. Chakrabarti

# Microbiologic quality of coastal beach sands

The quality of coastal and inland recreational waters and sand are of great importance as people use them both for bathing or water-contact sports. In 1989, the Mycology group of the National Institute of Health Dr. Ricardo Jorge worked on this subject for the first time, in a joint study with the Portuguese National Directorate of Health. During the following 10 years, several local beach sands were randomly analyzed.

Between 2000 and 2002 by invitation of the Portuguese Blue Flag Association, and based on the work previously done, a project involving several national institutions took place, aiming to define beach sand quality parameters and associated methods: "Microbiologic Quality of Coastal Beach Sands". During this project we split our country in 5 regions and from each region 3 beaches were selected: One blue flag awarded (thus with documented good maintenance and water quality), one wild (with the least possible human influence), and one with documented poor water quality (as a close reference of microbiological poor quality). Samples were collected every 2 months for 13 months. Based on the results obtained we were able to build mean values which we used as standard indicators of microbiological quality. These have been extended to inland beaches through our participation a European project, ICRew ([www.icrew.info](http://www.icrew.info)), and have recently been revised and asserted, based on blue flag awarded beaches. We also found out then that wet sand analysis is unnecessary and that water falls under the European and local water directives, being monitored by default in order to allow public use.

Originally, fungi isolated and counted were grouped into 4 categories, according to behaviour patterns and pathologies, regardless of individual positive or negative interactions within each group. The groups were: (a) Yeasts (genera *Candida*, *Cryptococcus*, *Saccharomyces*, *Rhodotorula*), (b) *Alergogenic* and potential pathogens (genera *Aspergillus*, *Fusarium*, *Scopulariopsis*, *Scedosporium*, *Chrysosporium*, *Scytalidium*), (c) Dermatophytes (genera *Microsporum*, *Epidermophyton* and *Trichophyton*) and (d) others (other potentially pathogenic genera). Bacterial parameters are total coliforms, *Escherichia coli* and intestinal enterococci.

All biological parameters have been looked into for statistical significant positive and negative correlations (Spearman's) amongst themselves and against physical-chemical parameters (total nitro-

gen, nitrates, nitrites, BOD5, COD, total phosphorus, phosphates, pH and turbidity), measured in the water samples and in sand washings. We could not consistently correlate the fungal parameters with any of others studied. We found hence no indicator of fungal quality of either sand or water with this study. Groups (b) and (d) could be regarded as similar, although not identical. Therefore, we have now abandoned group (d), as a routine, bearing in mind that in its place, data on the sand origin could become relevant as tropical/atypical species sometimes appear (e.g. *Coccidioides spp*) in imported sands (common practice these days) and should be included in group (b), when present.

Our local blue flag organization has been supporting our work in many ways, including financially, and the worldwide integration of the sand quality criteria to award a beach is already being discussed within the international organization ([www.fee-international.org](http://www.fee-international.org)).

In 2008, Blue flag Portugal will invite all candidate municipalities to integrate those that already do a sand quality check, together with the application for the award; the argument being, of course, prevention rather than treatment.

We currently provide this service to the community and the demand has been growing every year. We analyze at least 60 beaches throughout the summer (different samplings/beach). Now that the methods have been sorted and are fully in place, we're planning to extend our work internationally in order to raise information and relevance and ultimately compare experiences on other climates and regions, namely within Europe, with northern Atlantic and Mediterranean coasts and inland recreational water catchments and rivers.

If you feel your organization would like to be part of this work at an international level, please contact us at [sands@insa.min-saude.pt](mailto:sands@insa.min-saude.pt).

João Brandão