

# FUNGISCOPE

GLOBAL FUNGAL INFECTION REGISTRY

Global Fungal Infection Registry

Initiated in 2003

## Interim Report April 2023

Working group of the



Under the auspices of



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# Introduction

Due to the intensification of cytotoxic chemotherapy, the growing number of transplantation procedures and the extensive use of immunosuppressive drugs for various clinical conditions, invasive fungal infections (IFI) are an emerging problem worldwide.

*Candida* species and *Aspergillus fumigatus* remain the most frequent cause of IFI in immunocompromised patients but less common IFI caused by rare fungi are reported with increasing frequency. Mucormycosis has been an emerging disease only few decades ago, today it is recognized as a considerable threat in respective patient populations. Therapeutic standards have been developed for the most frequent IFI, i.e. candidiasis, aspergillosis and cryptococcosis, for rarer IFIs less robust treatment strategies or no effective treatment options are available. Clinicians are facing infections due to a variety of different fungi, still without reliable treatment recommendations. In a global effort, guidelines on the clinical management of uncommon IFI are developed, where recommendations - especially for the rarest IFI - are based on expert opinions and single center experiences only <sup>1-3</sup>. Therapeutic decision making on rare IFIs is not evidence-based as comprehensive data are not available to date.

In order to help alleviate the lack of knowledge on epidemiology, clinical course, biology and pathomechanisms, and finally to aid in facilitating an evidence-based diagnostic-therapeutic integrated approach of IFI caused by rare fungi, FungiScope® - A Global Invasive Fungal Infection Registry has been created in 2003. Via a web-based electronic case form ([www.clinicalsurveys.net](http://www.clinicalsurveys.net)) physicians, scientists and others contribute clinical cases.

With the increasing knowledge on the epidemiology, diagnostics and therapeutic management of fungal infections, improved strategies for early diagnosis and prompt optimized treatment will eventually be identified. Only through this joint and global effort it will be possible to improve patient care.

In this report, an overview on current results, achievements, future goals and ongoing developments of FungiScope® are presented.

# FungiScope<sup>®</sup> Registry Workflow

Everyone is welcome to join the effort and become a partner within the FungiScope<sup>®</sup> network and actively support our common goal of improving the clinical management patients with invasive fungal infections.

Via a web-based questionnaire, anonymized clinical information of proven and probable IFI cases are retrospectively collected <sup>4,5</sup>. Documented data includes information on underlying conditions and risk factors for IFI, diagnostic procedures (radiological and mycological), clinical manifestation of the IFI, antifungal treatment and response, and outcome. Cases are centralized reviewed by ID specialists of the FungiScope<sup>®</sup> team in Cologne, Germany (Figure 1a).

## Registration and Password Acquisition: [fungiscope@uk-koeln.de](mailto:fungiscope@uk-koeln.de)

### Document your case Anonymized, retrospective

#### Web-based Case Report Form

For clinical data documentation of invasive fungal infections (proven or probable<sup>4</sup>)

[CLINICALSURVEYS.NET](https://clinicalsurveys.net)

- ✓ Demographics
- ✓ Risk Factors
- ✓ Diagnostic Procedures
- ✓ Clinical Signs and Symptoms
- ✓ Site of Infection
- ✓ Treatment
- ✓ Outcome

+

### Send us the clinical fungal isolate (if available)

FungiScope Central Lab Cologne, Germany  
or

Designated Central Lab in your country  
(expenses for shipment are covered)

- ✓ Species Identification
- ✓ Therapeutic Drug Monitoring
- ✓ *In Vitro* Susceptibility Testing
- ✓ Biobanking
- ✓ Share isolates for research purposes with collaborators

\*caused by e.g. *Aspergillus fumigatus* and other *Aspergillus* species, *Mucorales*, *Alternaria*, *Cladosporium*, *Curvularia*, *Exophiala*, *Fusarium*, *Geotrichum*, *Lomentospora*, *Penicillium*, *Scedosporium*, *Trichosporon* species

(100€ remuneration per valid case)



Joint analysis and publication  
Biobank of rare fungal pathogens  
Networking and collaboration on other studies

Figure 1a. Project structure

Ideally, the respective clinical fungal isolates are collected, examined and stored in a biobank in Cologne, Germany (Figure 1b). The clinical and biological data are subsequently evaluated and analysed in a joint effort with the partners.

Anonymized data of cases entered in the registry are easily accessible via the web-based search engine FungiQuest ([www.fungiquest.net](http://www.fungiquest.net)), a tool for clinicians who are confronted with similar cases, to evaluate respective treatment and outcome patterns that may guide individual treatment strategies, where valid recommendations are not available to date (Figure 2).

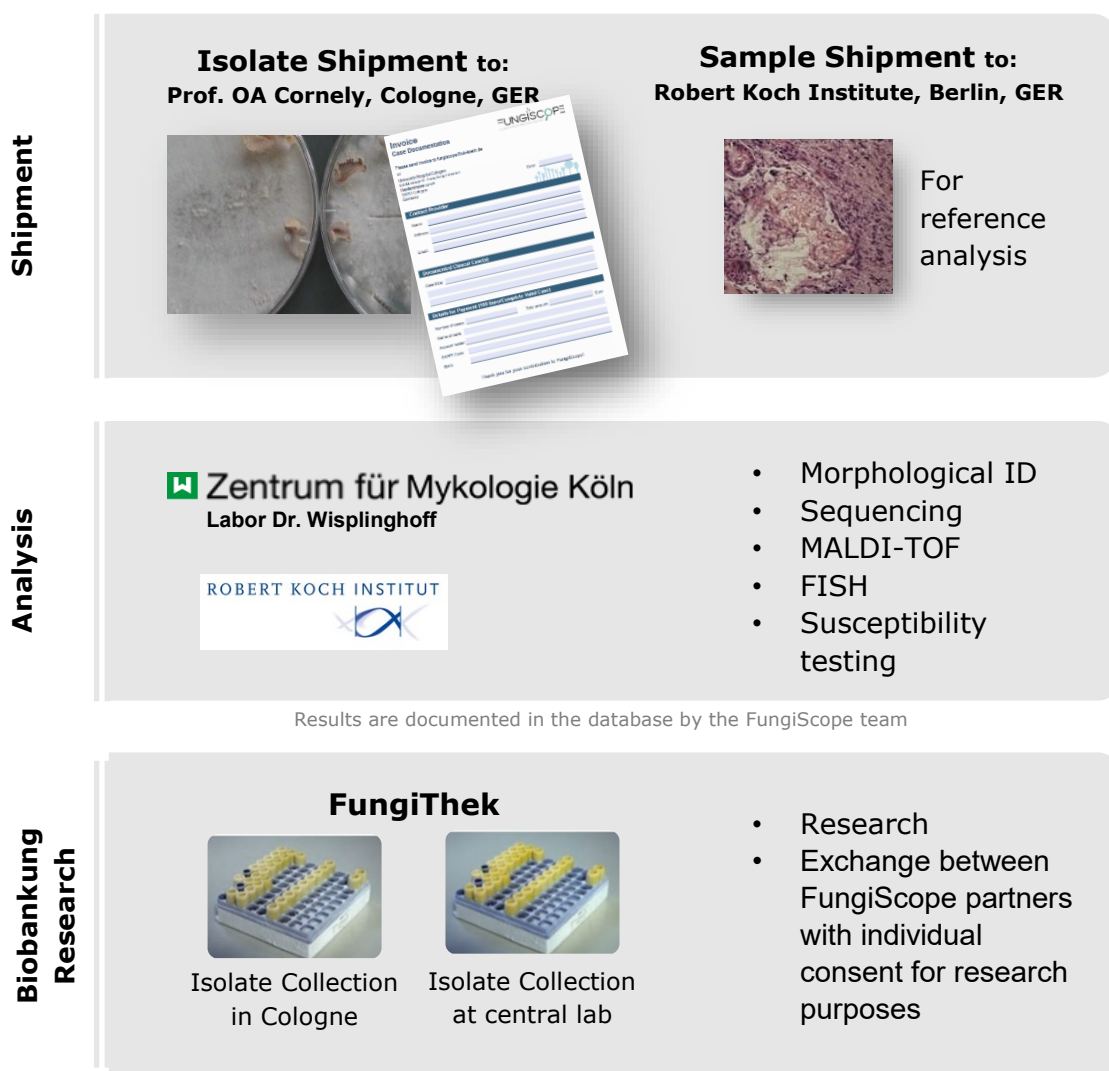


Figure 1b. FungiThek: Clinical fungal isolates can be send 1.) to the FungiScope® Central Lab in Cologne, Germany for formal identification and biobanking in the FungiThek or 2.) to the designated reference lab in your country (please see in section Study Coordinators below).

Reference analyses from biopsies will be performed at the Robert Koch Institute in Berlin, Germany.

# FungiQuest

Check for similar cases at [www.fungiquest.net](http://www.fungiquest.net)

Go to [www.fungiquest.net](http://www.fungiquest.net)



Type the name of the fungus and specify your search

Please enter fungus, select some search criteria below, or try one of our popular searches below

Popular searches: Rhizopus arrhizus Mucor Absidia sp Trichosporon faecale Yeast

Advanced Search Criteria (multiple selects possible) [Reset]

Risk Factors: None selected

Targeted Therapy: None selected

Patient alive: None selected

Site of Infection: None selected

Final Response: None selected

Browse through FungiScope cases with the same kind of fungal infection

Culture	PCR	Species	Risk Factors	Site	Empiric Therapy	Targeted Therapy	Surgery IFD	Final Response	Patient alive	Last Observed
✓		Mucor sp.	Chemotherapy, ICU, Neutropenia	Paranasal sinus(es)		Amphotericin B deoxycholate, Posaconazole solution	Sinosotomy	Stable Disease	Yes	2013
✓		Mucor sp.	HSCT, ICU	Lungs	Ca	Amphotericin B		Deterioration or failure	No	2013
✓		Mucor sp.	Chronic renal disease, HSCT, ICU	Lungs	Posaconazole solution, Voriconazole	Liposomal amphotericin B, Posaconazole solution		Deterioration or failure	No	2011
✓		Mucor sp.	Chronic pulmonary disease, ICU	Lungs		Posaconazole solution		Partial Response	Yes	2013
✓		Mucor sp.	Chemotherapy, HSCT, ICU, Neutropenia	Lungs	Amphotericin B lipid complex, Caspofungin	Amphotericin B lipid complex, Caspofungin		Deterioration or failure	No	2002

Figure 2. FungiQuest database search engine.

## Results

In the FungiScope® registry, 3,448 cases of invasive fungal infection (IFI) diagnosed between 1997 and 2023 have been documented, 2,670 cases of these are already finalized and considered valid for analysis. Eighty-five percent of cases were diagnosed in 2010 or later.

Main causative pathogens registered were Mucorales (n=930, 34.8%), yeasts (n=261, 9.8%), dematiaceae (n=201, 7.5%), and *Fusarium* spp. (n=192, 7.2%) followed by *Scedosporium* spp. (n=440, 16.5%) and *Penicillium*, *Paecilomyces*, *Purpureocillium* spp. (n=80, 3%) (Figure 3a). Between 7% (Dematiaceae) and 16% (Mucorales) of the cases had concomitant infections with other fungal pathogens (not shown).

Mucormycosis is the most frequent IFI in FungiScope®, with *Rhizopus*, *Mucor*, *Lichtheimia*, and *Rhizomucor* species being the main causative pathogens in this group (Figure 3a and b).

Aspergillosis with galactomannan follow up and non-*fumigatus* *Aspergillus*-related infections as well as COVID-19-associated fungal infections have been a focus of research since 2019 and 2020, respectively. Currently, 453 (16.9%) cases of *Aspergillus*-related infections are included, about 300 more cases are related to mixed fungal infections. Two-hundred cases were associated to COVID-19, most of them COVID-19-associated aspergillosis (CAPA).

The majority of cases (78.5%) were contributed from partners in Japan, China, Germany, the United States, South Korea, Thailand, Australia, Spain, India and Malaysia. The contribution of cases by country is shown in Figure 4.

Main sites of infection differed between fungal pathogens (Figure 5) but also between risk groups and geographical regions (data not shown). Patients with invasive mucormycosis most commonly had lung infection (57%), but also frequent involvement of paranasal sinuses (25%) and central nervous system (15%). Lung was also commonly affected in infections caused by rare Yeast, Dematiaceae, *Fusarium*, *Scedosporium* and *Aspergillus*-associated infections (23.3%, 20.2%, 28.0%, 33.8% and 76.6%, respectively) but sinuses were comparably less frequently involved (1%, 16.6%, 10.6%, 8% and 10.5%, respectively). *Fusarium*, rare Yeast and *Scedosporium* were commonly identified in blood (35.9%, 72.2% and 15%, respectively), for mucormycosis, aspergillosis and dematiaceae only rare cases of blood stream infections were noted (both <2% and <5, respectively).

Infections due to dematiaceae mostly involved deep soft tissue and skin, lungs, paranasal sinuses, and the central nervous system (range between 13.5% and 30%).

Frequent risk factors for the development of IFI are presented for the main fungal groups in Figure 6.

Chemotherapy and allogeneic haematopoietic stem cell transplantation (HSCT) for treatment of underlying malignancy and intensive care unit (ICU) stay were the most common risk factors for mucormycosis, fusariosis, dematiaceae, aspergillosis and yeast-related infections. Diabetes mellitus was frequently reported as a comorbidity overall (20.3%) and was the most common underlying condition in Dematiaceae-associated infections (27%). Chronic renal disease was comparably frequent in patients with yeast and Dematiaceae-associated infections (12% and 11%, respectively).

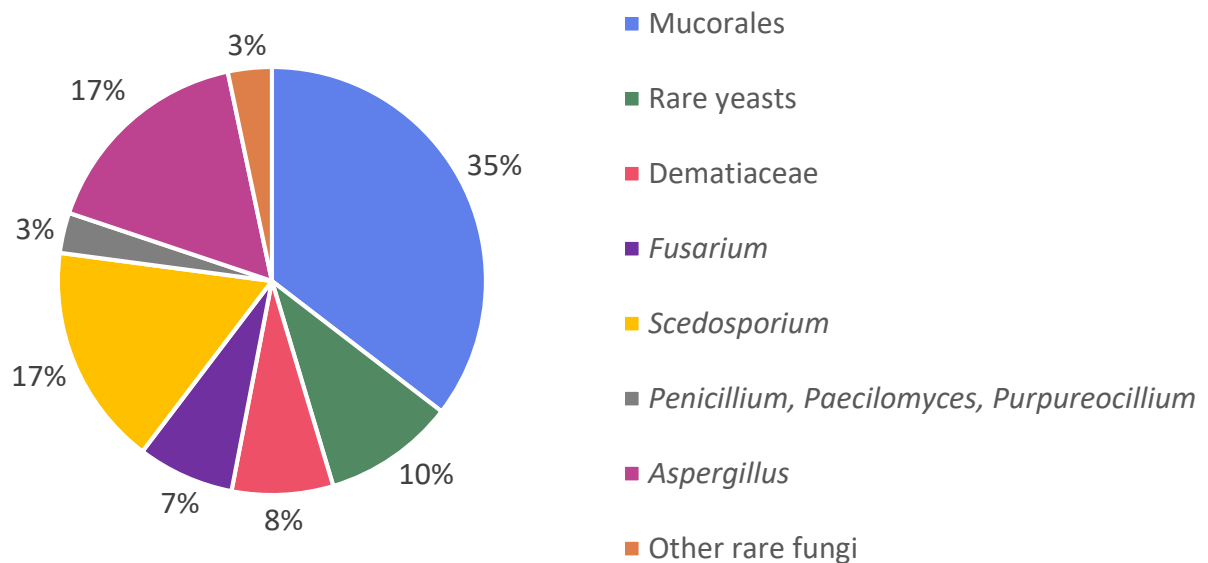


Figure 3a. Distribution of main fungal pathogens causing invasive infections in FungiScope® (including mixed infections).

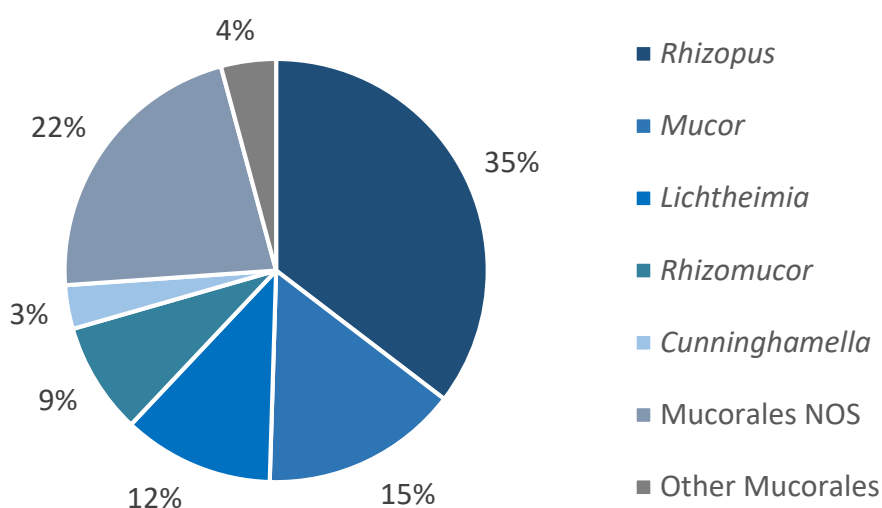


Figure 3b. Distribution of pathogens causing mucormycosis by genera.



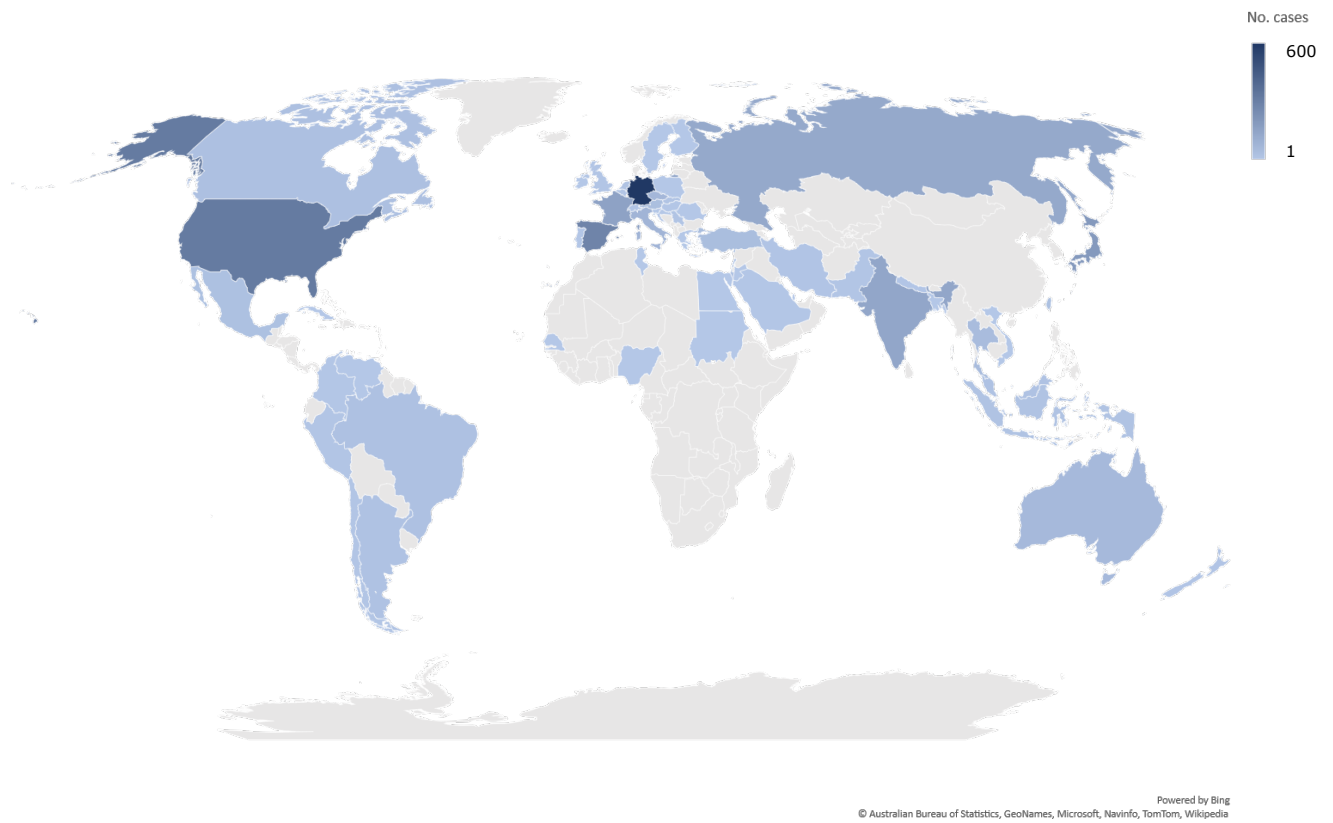
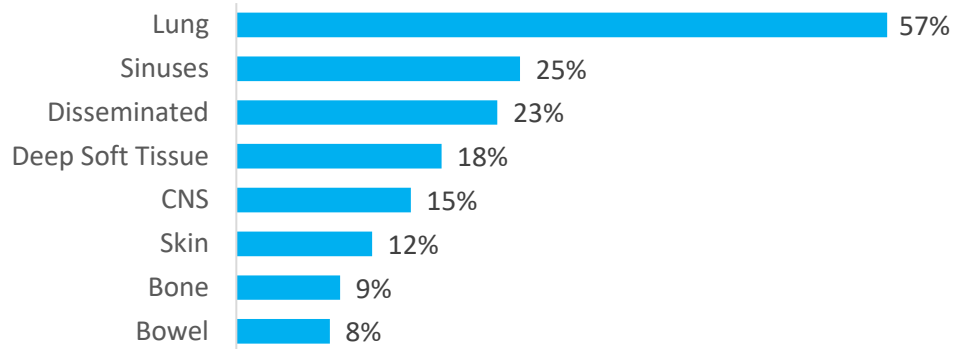
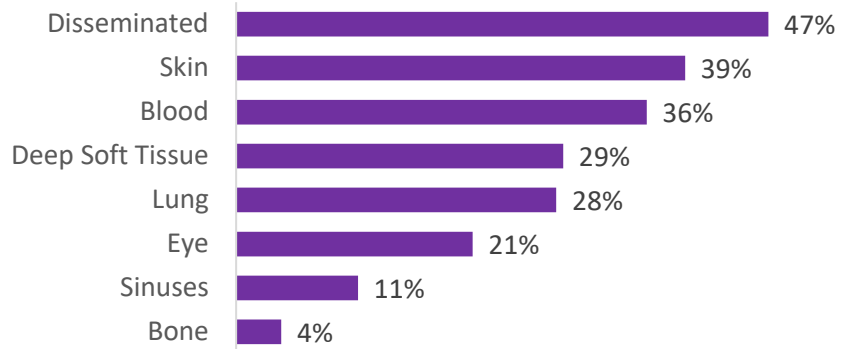


Figure 4. Number of cases per country contributed by FungiScope® partners.

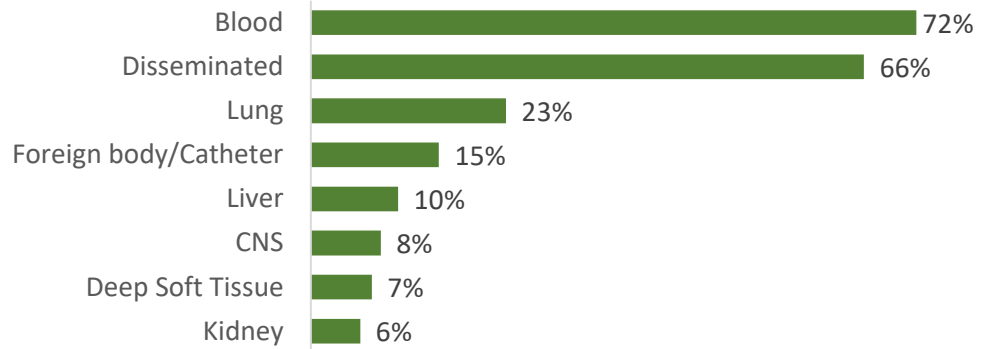
## Mucorales



## Fusarium



## Yeast



## Dematiaceae

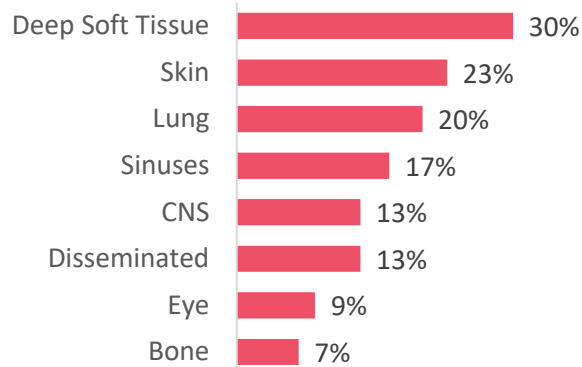


Figure 5. Main sites of infection for major groups of fungi.

CNS, Central Nervous System

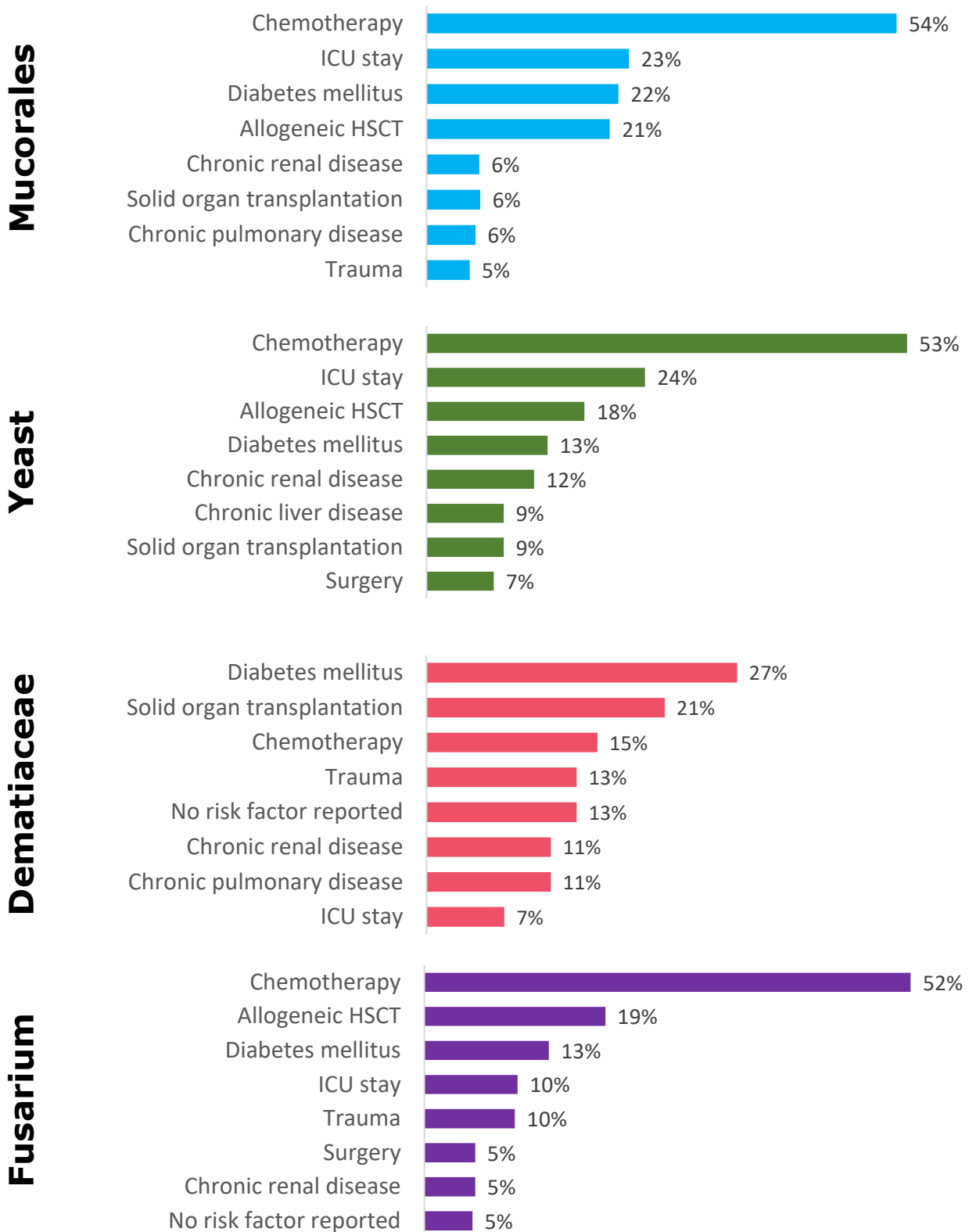


Figure 6. Main risk factors for major groups of fungi.

**HSCT** Hematopoietic stem-cell transplantation, **ICU** Intensive Care Unit

All-cause-mortality, mortality due to fungal infection and response to treatment differed among individual pathogens and are shown in Figure 7. The highest all-cause-mortality was observed in patients with infection caused by Mucorales (53.2%). Similar mortality was reported for patients with aspergillosis (46.2%), yeast (48.7%), and *Fusarium*-related infections (42.9%). Reported mortality attributable to fungal infections was highest in patients with mucormycosis (31.1%), similar for yeast-related infections (25.4%), and fusariosis (23.6%). Dematiaceae infection was associated with the lowest all-cause and attributable mortality (21.5% and 12.1%, respectively).

Favorable outcome considering partial and complete response to antifungal therapy was achieved in two thirds of patients with Dematiaceae-associated infections. Fungal infections caused by any other fungal pathogen, including Mucorales, *Aspergillus*, *Scedosporium* and *Fusarium* were associated with less favorable outcome overall, half of the patients in each group had partial or complete response at day of final assessment (Figure 7).

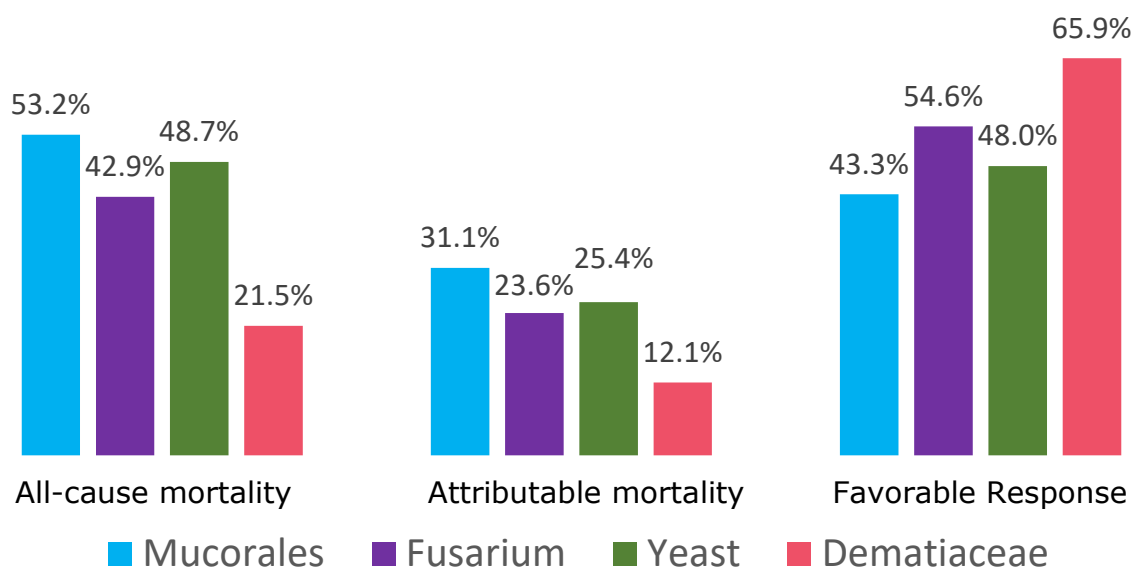


Figure 7. Mortality rates and clinical response at final assessment for major causative pathogen groups in FungiScope®. Favorable response is defined by complete or partial response assessed by the treating physician.

# Achievements and Goals

## Project presentations

Sep 21, 2022	International Society for Human and Animal Mycology (ISHAM 2022) (Talk, Poster), New Delhi, India
Sep 15-17, 2022	Sociedad Argentina de Infectología (SADI) XXII Conference (Talk), Buenos Aires, Argentina
Sep 12-14, 2022	56. Wissenschaftliche Tagung der Deutschsprachigen Mykologischen Gesellschaft (Myk2022), Vienna, Austria (Talk)
Mar 10, 2022	Live Webinar, Pfizer Ireland 'Recent Publication on Covid-19 - Associated Pulmonary Aspergillosis', Virtual Event (Talk)
Mar 4, 2022	Hot Topics in Infectious Diseases (HTIDE)-Conference 5 <sup>th</sup> Edition (Talk)
Nov 9, 2021	Approaching The Severely Infected Patient (ATHENA)-International Conference 2021 (Talk)
Oct 12, 2021	Zealands University Hospital Roskilde, Denmark, Virtual Event (Talk)
Oct 8 - 11, 2021	10th Trends in Medical Mycology (TIMM), Aberdeen, United Kingdom (Talk, Poster)
Sep 27, 2021	55. Wissenschaftliche Tagung der Deutschsprachigen Mykologischen Gesellschaft (DMykG) (Talk)
Jul 9 - 12, 2021	31st European Congress of Clinical Microbiology & Infectious Diseases (ECCMID) (Talk, Poster)
Jun 16 - 19, 2021	15. Kongress für Infektionskrankheiten und Tropenmedizin (KIT), Virtual Event (Talk, Poster)
Mar 20, 2021	Taiwan Infectious Disease Society Annual Meeting (Lecture)
Feb 24 - Mar 3, 2021	Pan American Health Organization: PAHO/WHO, Virtual Events (Talk)
Jan 29, 2021	Pfizer Medical Affairs India Virtual Train The Trainer Cresamba Launch Symposium (Talk)
Oct 21-25, 2020	IDWeek Virtual Event (Poster)
Sep 23 - 25, 2020	ECCVID ESCMID Conference on Coronavirus Disease, Virtual Event (Poster)
Sep 23, 2020	Mycology Week 2020, Antioquía University, Medellín, Colombia, Virtual Event (Talk)

Sep 16-18, 2020	54. Wissenschaftliche Tagung der Deutschsprachigen Mykologischen Gesellschaft e.V. (Talk)
Apr 2020 - Canceled	30th European Congress of Clinical Microbiology & Infectious Diseases (ECCMID) (Poster)
Nov 16 – 19, 2019	17th INFOCUS and 1st ISHAM – LATAM Congress, Salvador, Brazil (Poster)
Oct 11 – 14, 2019	9th Trends in Medical Mycology (TIMM), Nice, France (Oral, Poster)
Oct 2 – 6, 2019	IDWeek 2019, Advancing Science, Improving Care, Washington, DC, USA (Poster)
Sep 26, 2019	IPHS Day 2019, University of Cologne, Germany (Talk)
Jun 20 – 24, 2019	ASM Microbe 2019, San Francisco, USA (Poster)
May 23 – 25, 2019	XXIII National Congress of the Spanish Society of Infectious Diseases and Clinic Microbiology, Madrid, Spain (Talk, Poster)
Apr 13 – 16, 2019	29th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID), Amsterdam, Netherlands (Poster)
Apr 13 – 16, 2019	ECCMID - ESCMID Networking Corner 2019, Amsterdam, Netherlands (Poster)
Dec 3 - 4, 2018	German Center for Infection Research (DZIF) Annual Meeting, Heidelberg, Germany (Talk, Poster)
Oct 3 - 7, 2018	IDWeek 2018, San Francisco, USA (Poster)
Sep 25 – 28, 2018	2018 MSG-ERC Biennial Meeting, Big Sky, MT, USA (Poster)
Jun 30 – Jul 4, 2018	20th ISHAM, Amsterdam, Netherlands (Talk)
Apr 21 – 24, 2018	28th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID), Madrid, Spain (Mini-oral ePoster)
Oct 10, 2017	ECMM Excellence Center Symposium, Cologne, Germany (Posters, Oral)
Oct 6 – 9, 2017	8th Trends in Medical Mycology (TIMM), Belgrade, Serbia (Talk, Poster)
Sep 28 – 30, 2017	Joint DGI and DZIF Annual Meeting, Hamburg, Germany (Talk)
Aug 31 – Sep 02, 2017	51. Wissenschaftliche Tagung der Deutschsprachigen Mykologischen Gesellschaft e. V., Münster, Germany (Talk)

## Full Publications

- Nov 2022 Sprute R, Van Braeckel E, Flick H, Hoenigl M, Kosmidis C, Agarwal R, Davidsen JR, Laursen CB, Cornely OA, Seidel D. *EQUAL CPA Score 2022: a tool to measure guideline adherence for chronic pulmonary aspergillosis*. **J Antimicrob Chemother.** 2022
- Sep 2022 Del Principe MI, Seidel D, Criscuolo M, Dargenio M, Ráčil Z, Piedimonte M, Marchesi F, Nadali G, Koehler P, Fracchiolla N, Cattaneo C, Klimko N, Spolzino A, Karapinar DY, Demiraslan H, Duarte RF, Demeter J, Stanzani M, Melillo LMA, Basilico CM, Cesaro S, Paterno G, Califano C, Delia M, Buzzatti E, Busca A, Cornely OA\*and Pagano L\*, behalf of the FUNGISCOPE (Global Emerging Fungal Infection Registry) and the SEIFEM (Sorveglianza Epidemiologica Infezioni nelle Emopatie) \* *Equal senior contribution. Clinical Features and Prognostic Factors of Magnusiomyces (Saprochaete) Infections in Hematology. A Multicenter Study of SEIFEM/FungiScope*. **Mycoses.** 2022
- Sep 2022 Sal E, Stemler J, Salmanton-García J, Falces-Romero I, Kredics L, Meyer E, Würstl B, Lass-Flörl C, Racil Z, Klimko N, Cesaro S, Jyoti Kindo A, Wisplinghoff H, Koehler P, Cornely OA, Seidel D. *Invasive Trichoderma spp. infections: clinical presentation and outcome of cases from the literature and the FungiScope® registry*. **J Antimicrob Chemother.** 2022
- Jul 2022 Hoenigl M, Seidel D, Carvalho A, Rudramurthy SM, Arastehfar A, Gangneux JP, Nasir N, Bonifaz A, Araiza J, Klimko N, Serris A, Lagrou K, Meis JF, Cornely OA, Perfect JR, White PL, Chakrabarti A, on behalf of ECMM and ISHAM collaborators. *The emergence of COVID-19 associated mucormycosis: a review of cases from 18 countries*. **Lancet Microbe.** 2022
- May 2022 Koehler P, von Stillfried S, Borrega JG, Fuchs F, Salmanton-García J, Pult F, Böll B, Eichenauer DA, Shimabukuro-Vornhagen A, Kurzai O, Boor P, Kochanek M, Cornely OA. *Aspergillus tracheobronchitis in COVID-19 ARDS patients – a cohort study*. **Eur Respir J.** 2022
- May 2022 Sprute R, Bethe U, Chen SCA, Cornely OA. *EQUAL Trichosporon Score 2022: an ECMM score to measure QUALity of the clinical management of invasive Trichosporon infections*. **J Antimicrob Chemother.** 2022
- Apr 2022 Prattes J, Wauters J, Giacobbe DR, Salmanton-García J, Maertens J, Bourgeois M, Reynders M, Rutsaert L, Van Regenmortel N, Lormans P, Feys S, Reisinger AC, Cornely OA, Lahmer T, Valerio M, Delhaes L, Jabeen K, Steinmann J, Chamula M, Bassetti M, Hatzl S, Rautemaa-Richardson R, Koehler P, Lagrou K, Hoenigl M, The ECMM-CAPA Study Groupy. *Risk factors and outcome of pulmonary aspergillosis in critically ill coronavirus disease 2019 patientsda multinational observational study by the European Confederation of Medical Mycology*. **Clin Microbiol Infect.** 2022

- Apr 2022 Sprute R, Salzer HJF, Seidel D. *CPAnet: the challenges of gaining evidence-based knowledge in chronic pulmonary aspergillosis*. **Eur Respir J**. 2022
- Feb 2022 Blankenheim Y, Salmanton-García J, Seifert H, Cornely OA, Koehler P. *Attributable mortality of candidemia at a German tertiary hospital from 1997 to 2001 before the introduction of echinocandins*. **Mycoses**. 2022
- Oct 2021 Seidel D, Simon M, Sprute R, Lubnow M, Evert K, Speer C, Seeßle J, Khatamzas E, Merle U, Behrens C, Blau IW, Enghard P, Haas CS, Steinmann J, Kurzai O, Cornely OA. *Results from a national survey on COVID-19-associated mucormycosis in Germany: 13 patients from six tertiary hospitals*. **Mycoses**. 2021
- May 2021 Sprute R, Salmanton-García J, Sal E, Malaj X, Ráčil Z, Ruiz de Alegría Puig C, Falces-Romero I, Barac A, Desoubeaux G, Kindo AJ, Morris AJ, Pelletier R, Steinmann J, Thompson GR, Cornely OA, Seidel D, Stemler J. *Invasive infections with *Purpureocillium lilacinum*: clinical characteristics and outcome of 101 cases from FungiScope and the literature*. **J Antimicrob Chemother**. 2021
- Feb 2021 Salmanton-García J, Sprute R, Stemler J, Bartoletti M, Dupont D, Valerio M, García-Vidal C, Falces-Romero I, Machado M, de la Villa S, Schroeder M, Hoyo I, Hanses F, Ferreira-Paim K, Giacobbe DR, Meis JF, Gangneux JP, Rodríguez-Guardado A, Antinori S, Sal E, Malaj X, Seidel D, Cornely OA, Koehler P; FungiScope European Confederation of Medical Mycology/The International Society for Human and Animal Mycology Working Group. *COVID-19-Associated Pulmonary Aspergillosis, March-August 2020*. **Emerg Infect Dis**. 2021 Feb 4;27(4)
- Feb 2021 Sprute R, Salmanton-García J, Sal E, Malaj X, Falces-Romero I, Hatvani L, Heinemann M, Klimko N, López-Soria L, Meletiadis J, Shruti M, Steinmann J, Seidel D, Cornely OA, Stemler J. *Characterization and outcome of invasive infections due to *Paecilomyces variotii*: analysis of patients from the FungiScope registry and literature reports*. **J Antimicrob Chemother**. 2021 Feb 11;76(3):765-774
- Nov 2020 Salmanton-García J, Koehler P, Kindo A, Falces-Romero I, García-Rodríguez J, Ráčil Z, Chen SC, Klimko N, Desoubeaux G, Thompson GR, III, Benítez-Peñuela MÁ, Rodríguez JY, Sheppard DC, Hoenigl M, Le Govic Y, Badali H, Baddley JW, Chander J, Ingram PR, Pakstis DL, Mellinghoff SC, Atıcı S, Cesaro S, Chakrabarti A, Dupont D, González GM, Hatvani L, Herbrecht R, Klyasova G, Lass-Flörl C, Mareş M, Mullane K, Vinh DC, Wisplinghoff H, Lackner M, Cornely OA, Seidel D; ECMM/ISHAM working group. *Needles in a haystack: Extremely rare invasive fungal infections reported in FungiScope®-Global Registry for Emerging Fungal Infections*. **J Infect**. 2020 Nov;81(5):802-815
- Oct 2020 Stemler J, Hamed K, Salmanton-García J, Rezaei-Matehkolaei A, Gräfe SK, Sal E, Zarrouk M, Seidel D, Abdelaziz Khedr R, Ben-Ami R, Ben-



- Chetrit E, Roth Y, Cornely OA. *Mucormycosis in the Middle East and North Africa: Analysis of the FungiScope® registry and cases from the literature*. **Mycoses**. 2020 Oct;63(10):1060-1068
- Apr 2020 Jenks JD, Seidel D, Cornely OA, Chen S, van Hal S, Kauffman C, Miceli MH, Heinemann M, Christner M, Jover Sáenz A, Burchardt A, Kemmerling B, Herbrecht R, Steinmann J, Shoham S, Gräber S, Pagano L, Deeren D, Slavin MA, Hoenigl M. *Clinical characteristics and outcomes of invasive Lomentospora prolificans infections: Analysis of patients in the FungiScope® registry*. **Mycoses**. 2020 May;63(5):437-442. Epub 2020 Apr 15.
- Jan 2020 Jenks JD, Seidel D, Cornely OA, Chen S, van Hal S, Kauffman C, Miceli MH, Heinemann M, Christner M, Jover Sáenz A, Burchardt A, Kemmerling B, Herbrecht R, Steinmann J, Shoham S, Gräber S, Pagano L, Deeren D, Aslam S, Taplitz R, Revankar SG, Baddley J, Mehta SR, Reed S, Slavin MA, Hoenigl M. *Voriconazole plus terbinafine combination antifungal therapy for invasive Lomentospora prolificans infections: analysis of 41 patients from the FungiScope® registry 2008-2019*. **Clin Microbiol Infect**. 2020 Jan 20. pii: S1198-743X(20)30037-9. [Epub ahead of print]
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# Presentation of recent publications

**Journal of Antimicrobial Chemotherapy**

*J Antimicrob Chemother* 2022; **77**: 1779–1784  
<https://doi.org/10.1093/jac/dkac085> Advance Access publication 23 March 2022

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**EQUAL *Trichosporon* Score 2022: an ECMM score to measure QUALITY of the clinical management of invasive *Trichosporon* infections**

Rosanne Sprute <sup>1,2,3</sup>, Ullrich Bethé <sup>1,2</sup>, Sharon C.-A. Chen <sup>4,5</sup> and Oliver A. Cornely <sup>1,2,3,6,7\*</sup>

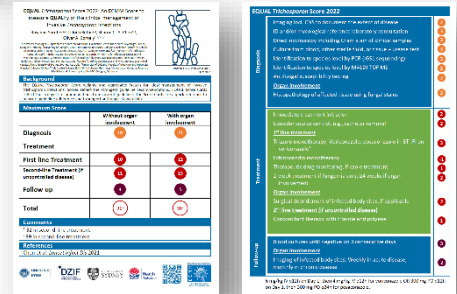
- NEW *Trichosporon* EQUAL Scorecard
- Contains 18 items with a max. score of 39 points

**Link:**

[Sprute et al. J Antimicrob Chemother. 2022 Mar 23](#)

Rosanne Sprute, MD

[Oliver.Cornely@uk-koeln.de](mailto:Oliver.Cornely@uk-koeln.de)













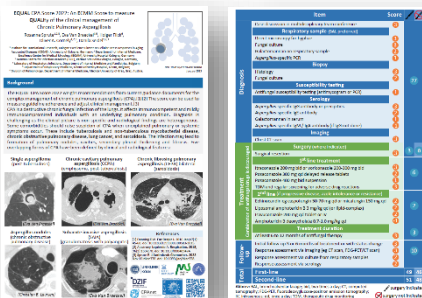
**Journal of Antimicrobial Chemotherapy**

*J Antimicrob Chemother* 2023; **78**: 225–231  
<https://doi.org/10.1093/jac/dkac378> Advance Access publication 14 November 2022

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**EQUAL CPA Score 2022: a tool to measure guideline adherence for chronic pulmonary aspergillosis**

Rosanne Sprute <sup>1,2,3\*</sup>, Eva Van Braeckel <sup>4,5</sup>, Holger Flick <sup>6</sup>, Martin Hoenigl <sup>7,8</sup>, Chris Kosmidis <sup>9</sup>, Ritesh Agarwal <sup>10</sup>, Jesper R Davidsen <sup>11,12</sup>, Christian B Laursen <sup>11,12</sup>, Oliver A Cornely <sup>1,2,3,13</sup> and Danila Seidel <sup>1,2,3</sup>



- NEW CPA EQUAL Scorecard
- Contains 27 items with a max. score of 51 points

**Link:**

[Sprute et al. J Antimicrob Chemother. 2022 Mar 23](#)

Rosanne Sprute, MD

[Oliver.Cornely@uk-koeln.de](mailto:Oliver.Cornely@uk-koeln.de)

# Clinical features and prognostic factors of *Magnusiomyces* (*Saprochaete*) infections in haematology. A multicentre study of SEIFEM/Fungiscope

- 40% of *Magnusiomyces*-associated infections occurred during antifungal prophylaxis
- First-line antifungal therapy with azoles, alone or in combination, was associated with improved response
- Overall day-30 mortality rate: 43%
- Factors associated with higher mortality: septic shock, corticosteroid treatment  $\geq 14$  days, lack of neutrophil recovery

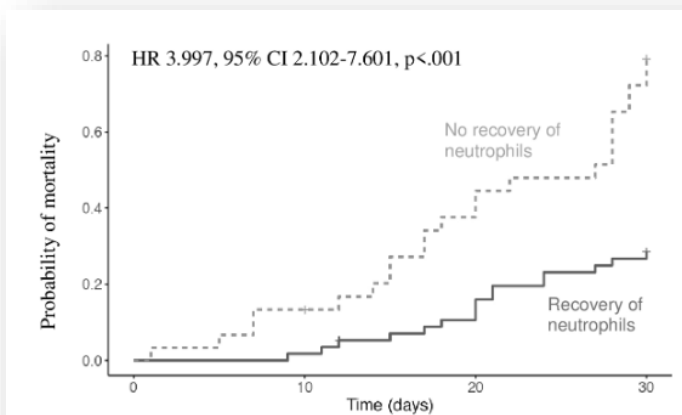


FIGURE 2 Overall Mortality (OM) based on neutrophil recovery. Kaplan-Meier plot comparing OM of patients with recovery of neutrophils (continuous dark gray line) versus OM of patients without recovery of neutrophils (dotted gray line)

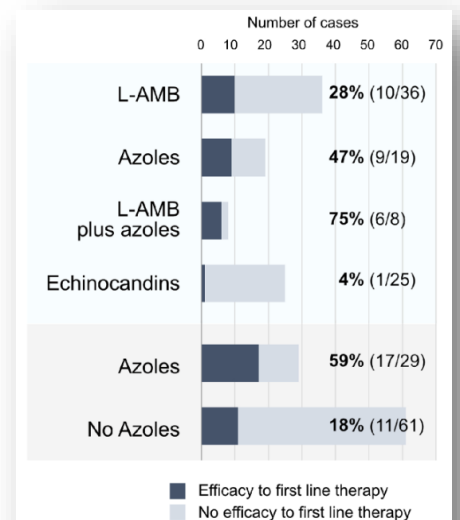


FIGURE 1 Response to first-line antifungal therapy by different antifungal agents used. AT, antifungal therapy; L-AMB, liposomal amphotericin B.

**Link:**

[Del Principe et al. Mycoses. 2022 Sep 19](https://doi.org/10.1111/myc.13524)

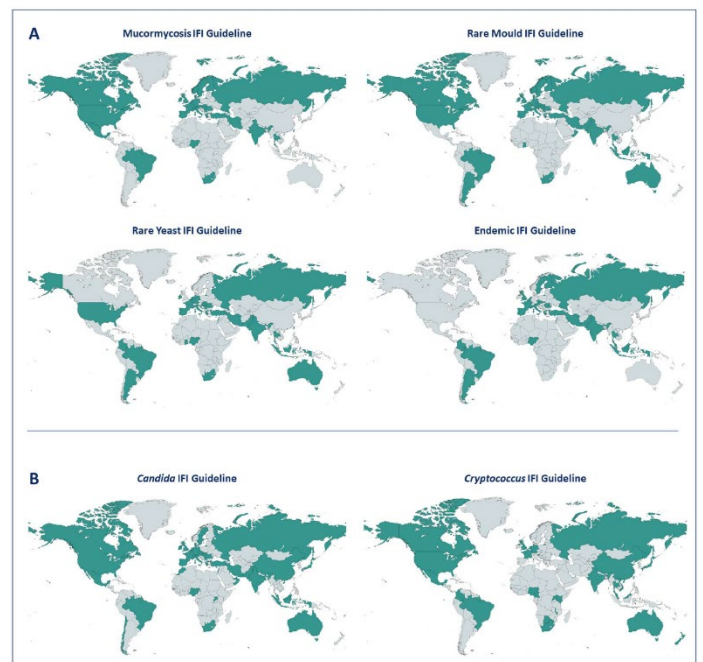
Maria Ilaria Del Principe; Danila Seidel, PhD

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- Overview of the main projects regarding Medical Mycology at the University Hospital Cologne (ECMM Excellence Center)
- One World One Guideline Project – Summary

Year of publication	Guideline
2019	Mucormycosis (with MSG-ERC)
2022	CAPA (adapted methodology)
2021	Rare Molds Endemic Mycoses Rare Yeast
~2022	<i>Cryptococcus</i>
	<i>Candida</i>
~2023	<i>Aspergillus</i>



- Overview of Treatment Algorithms throughout the University Hospital of Cologne

- Presentation of EQUAL Score Cards and translations

The image shows two EQUAL Score Cards. The left card is in Chinese, titled '2018 EQUAL 曲霉病评分: ECMM 学会评分'. It includes a table for diagnosis, treatment, and follow-up, with scores ranging from 10 to 27. The right card is in English, titled '2018 EQUAL Aspergillus Score Card'. It lists clinical criteria such as 'Neutrophil count <math>< 10^6</math> per mm<sup>3</sup>' and 'Persistent fever > 48 hours', each with a corresponding score. Both cards include logos for UNIKLINIK KÖLN and ECMM.</sup>

- Clinical Trials at the ECMM EC Cologne
- YoungECMM
- YouTube Channel "IDIM – Infectious Diseases in Motion" and YouKu Channel
- ECMM Consulting Service
- Overview on Publications

The image features a world map with numerous blue dots indicating the locations of over 1,000 partners against invasive fungal infections. The text 'More than 1,000 Partners Against Invasive Fungal Infections' is prominently displayed at the top, along with the 'Fungi scope' logo. At the bottom, the German text 'Mehr als 1.000 Partner gegen invasive Pilzinfektionen' is shown, along with the logo of Universität zu Köln. A small credit line at the bottom right reads 'Edited by Dr. Jan Sakmann-Garcia'.

**Link:**

<https://www.ecmm.info/wp-content/uploads/ECMM-Progress-Report-EC-Cologne.pdf>

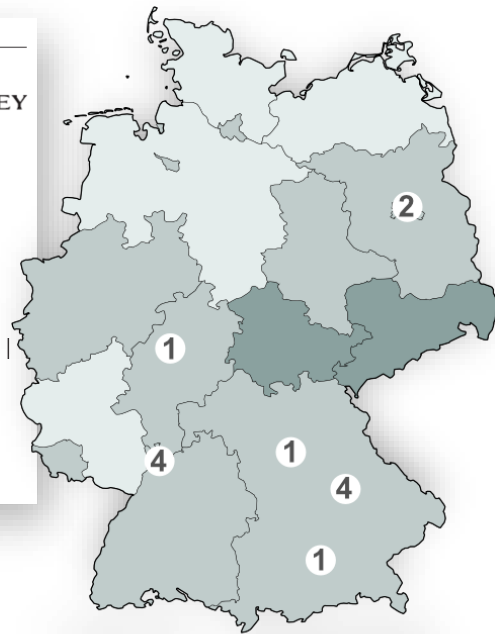
Danila Seidel, PhD

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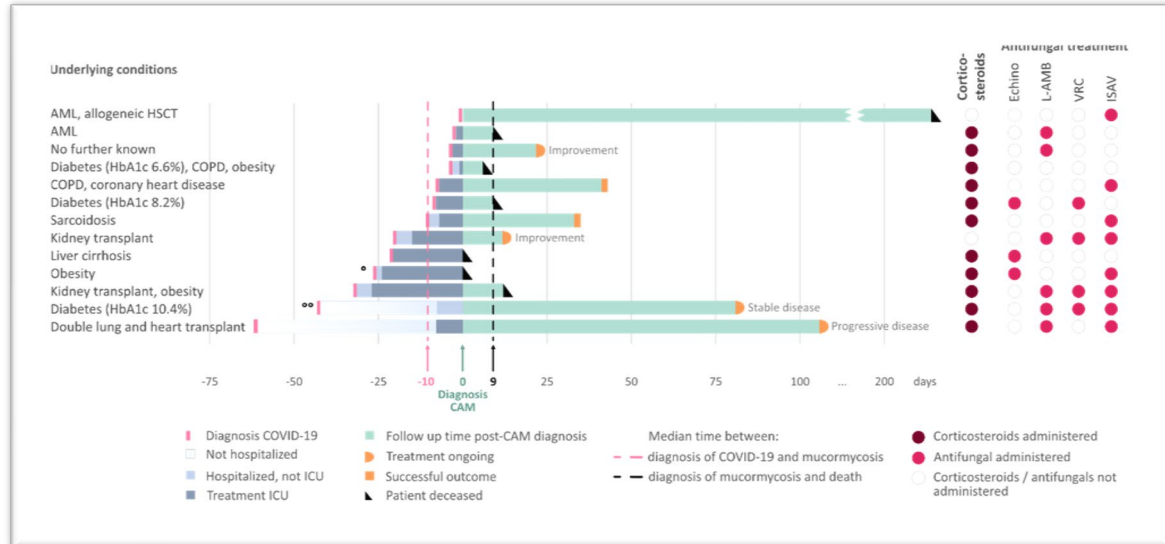


## Results from a national survey on COVID-19-associated mucormycosis in Germany: 13 patients from six tertiary hospitals

Danila Seidel<sup>1,2,3</sup> | Michaela Simon<sup>4</sup> | Rosanne Sprute<sup>1,2,3</sup> | Matthias Lubnow<sup>5</sup> |  
 Katja Evert<sup>6</sup> | Claudius Speer<sup>7</sup> | Jessica Seeßle<sup>8</sup> | Elham Khatamzas<sup>9</sup> |  
 Uta Merle<sup>8</sup> | Christopher Behrens<sup>10</sup> | Igor Wolfgang Blau<sup>11</sup> | Philipp Enghard<sup>12</sup> |  
 Christian S. Haas<sup>13</sup> | Joerg Steinmann<sup>14,15</sup> | Oliver Kurzai<sup>16,17</sup> | Oliver  
 A. Cornely<sup>1,2,3,18,19</sup>



- Most CAM presented as pulmonary infection (11/13)
- Most had severe/critical COVID-19 (12/13), 11 required intensive care involving mechanical ventilation
- Median time between diagnosis of COVID-19 and CAM: 10 (range 0 – 62) days
- All-cause mortality: 53.8%



### Link:

[Seidel et al. Mycoses. 2021 Oct 16.](#)

Danila Seidel, PhD

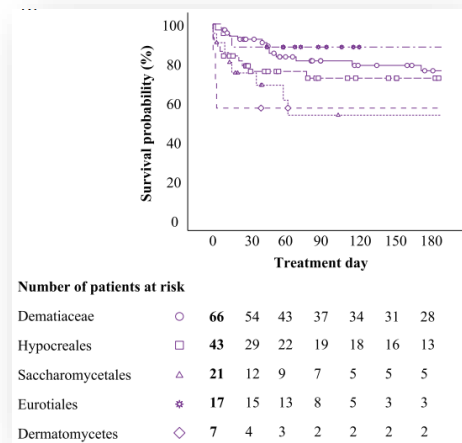
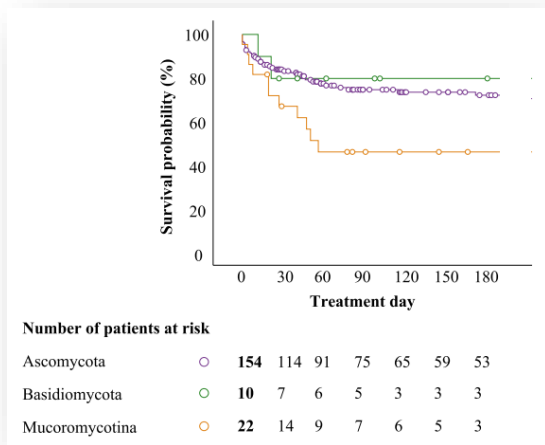
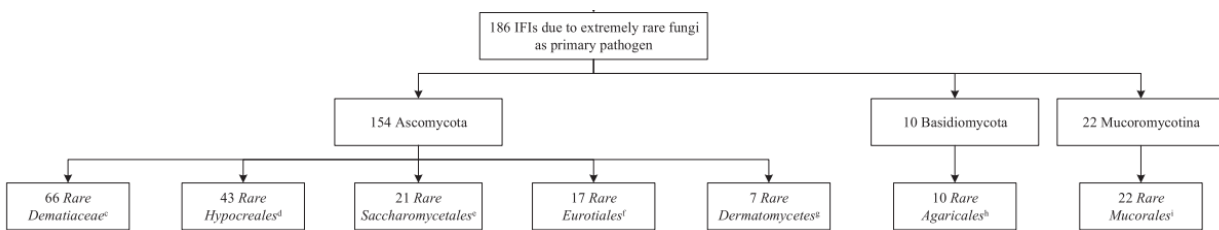
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### Needles in a haystack: Extremely rare invasive fungal infections reported in FungiScope®—Global Registry for Emerging Fungal Infections



Jon Salmanton-García<sup>a</sup>, Philipp Koehler<sup>a,b</sup>, Anupma Kindo<sup>c</sup>, Iker Falces-Romero<sup>d</sup>, Julio García-Rodríguez<sup>d</sup>, Zdeněk Ráčil<sup>e,f,g</sup>, Sharon C.-A. Chen<sup>h,i</sup>, Nikolai Klimko<sup>j</sup>, Guillaume Desoubreux<sup>k,l</sup>, George R. Thompson, III<sup>m,n</sup>, Miguel-Ángel Benítez-Peñuela<sup>o</sup>, José-Yesid Rodríguez<sup>o</sup>, Donald C. Sheppard<sup>p</sup>, Martin Hoenig<sup>q,r,s</sup>, Yohann Le Govic<sup>t</sup>, Hamid Badali<sup>u</sup>, John W. Baddley<sup>v,w,x</sup>, Jagdish Chander<sup>y</sup>, Paul R. Ingram<sup>z,aa</sup>, Diana L. Pakstis<sup>bb</sup>, Sibylle C. Mellinghoff<sup>a</sup>, Serkan Atıcı<sup>cc</sup>, Simone Cesaro<sup>dd</sup>, Arunaloke Chakrabarti<sup>ee</sup>, Damien Dupont<sup>ff,gg</sup>, Gloria M. González<sup>hh</sup>, Lóránt Hatvani<sup>ii,jj</sup>, Raul Herbret<sup>kk</sup>, Galina Klyasova<sup>ll</sup>, Cornelia Lass-Flörl<sup>mm</sup>, Mihai Mareş<sup>nn</sup>, Kathleen Mullane<sup>oo</sup>, Donald C. Vinh<sup>pp</sup>, Hilmar Wisplinghoff<sup>qq,rr,ss</sup>, Michaela Lackner<sup>mm</sup>, Oliver A. Cornely<sup>a,tt,uu,vv</sup>, Danila Seidel<sup>a,\*</sup>, The FungiScope® ECMM/ISHAM working group<sup>1</sup>





**Link:**

[Salmanton-García et al. J Infect. 2020 Nov;81\(5\):802-815.](https://doi.org/10.1093/infdis/jiaa111)

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## Mucormycosis in the Middle East and North Africa: Analysis of the FungiScope<sup>®</sup> registry and cases from the literature

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 Ali Rezaei-Matehkolaei<sup>5</sup>  | Stefanie K. Gräfe<sup>1,2,6</sup>  | Ertan Sal<sup>1,2</sup>  |  
 Marouan Zarrouk<sup>1,2</sup>  | Danila Seidel<sup>1,2</sup>  | Reham Abdelaziz Khedr<sup>7</sup>  |  
 Ronen Ben-Ami<sup>8</sup>  | Eli Ben-Chetrit<sup>9</sup>  | Yehudah Roth<sup>10</sup> | Oliver A. Cornely<sup>1,2,3,11</sup> 

**Patients:** 310 cases of mucormycosis in the MENA region

**Risk:** Diabetes mellitus (49.7%)  
 Conditions associated with immunosuppression (46.5%)

### Mortality:

	N (%)	Mortality (%)
<i>Rhino-orbital-cerebral</i>	145 (46.8)	56 (38.6)
<i>Pulmonary</i>	38 (12.3)	17 (44.7)
<i>Curaneous</i>	35 (11.3)	8 (22.9)
<i>Gastrointestinal</i>	6 (1.9)	5 (83.3)
<i>Disseminated</i>	59 (19.0)	36 (61.0)

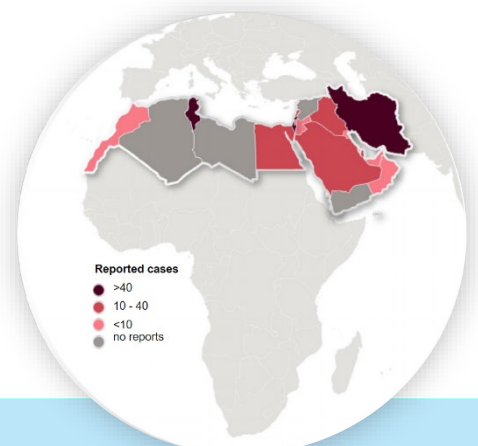
**Conclusions:** Increase of reports of mucormycosis in the MENA region over the past few decades  
 Treatment with antifungals and surgery is associated with improved outcome  
 Mortality rates decreased from 47.8% before 1990 to 32.3% in the 2010s

### Link:

[Stemler et al. Mycoses. 2020 Oct;63\(10\):1060-1068.](#)

Jannik Stemler, MD

[Jannik.Stemler@uk-koeln.de](mailto:Jannik.Stemler@uk-koeln.de)





### Invasive *Scedosporium* spp. and *Lomentospora prolificans* infections in pediatric patients: Analysis of 55 cases from FungiScope<sup>®</sup> and the literature



Danila Seidel<sup>a,b,\*</sup>, Angela Hassler<sup>c</sup>, Jon Salmanton-García<sup>a,b</sup>, Philipp Koehler<sup>a,b</sup>, Sibylle C. Mellinghoff<sup>a,b</sup>, Fabianne Carlesse<sup>d</sup>, Matthew P. Cheng<sup>e</sup>, Iker Falces-Romero<sup>f</sup>, Raoul Herbrecht<sup>g</sup>, Alfredo Jover Sáenz<sup>h</sup>, Nikolai Klimko<sup>i</sup>, Mihai Mareş<sup>j</sup>, Cornelia Lass-Flörl<sup>k</sup>, Pere Soler-Palacín<sup>l</sup>, Hilmar Wisplinghoff<sup>m,n,o</sup>, Oliver A. Cornely<sup>a,b,p</sup>, Zoi Pana<sup>q</sup>, Thomas Lehrnbecher<sup>c</sup>

**Patients:** 55 children with *Scedosporium* and *Lomentospora*-related infections

**Risk:** Immunosuppression, malignancy, allogeneic HSCT, trauma, near drowning

**Mortality:**

	Overall	Immuno-compromised	Immuno-competent
<i>Scedosporium</i> spp.	42%	46%	85%
<i>Lomentospora</i> spp.	50%	40%	0%

**Conclusions:** Severity of infection predicts worse outcome irrespective of immune status - Localized infection predicts good outcome  
Voriconazole use and surgical treatment are associated with improved outcome in children



**Link:**

[Seidel et al. International Journal of Infectious Diseases. 2019 Dec.](#)

Danila Seidel, PhD

[Danila.Seidel@uk-koeln.de](mailto:Danila.Seidel@uk-koeln.de)

## Risk factors and mortality in invasive *Rasamsonia* spp. infection: Analysis of cases in the FungiScope® registry and from the literature

Jannik Stemler, Jon Salmanton-García, Danila Seidel, Barbara Alexander, Hartmut Bertz, Martin Hoenigl, Raoul Herbrecht, Lisa Meintker, Arne Meißner, Sibylle C. Mellinghoff, Ertan Sal, Marouan Zarrouk, Philipp Koehler, Oliver A. Cornely  ... See fewer authors 

First published: 26 November 2019 | <https://doi.org/10.1111/myc.13039>

**Patients:** 23 *Rasamsonia* spp. cases

**Risk:** Chronic granulomatous disease, immunosuppression, malignancy, HSCT

### In vitro susceptibility:

Amphotericin B (S/R)

Caspofungin (S)

Micafungin (S)

Posaconazole (R)

Voriconazole (R)

**Mortality:** 39%

**Conclusions:** No predictors of mortality identified, but  
Frequently misidentified as *Paecilomyces* spp. (48%)  
Frequently BT-IFI (56.5%)  
Species identification by PCR necessary

### Link:

[Stemler et al. Mycoses. 2019 Nov 26.](#)

Jannik Stemler, MD

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## Matched-paired analysis of patients treated for invasive mucormycosis: standard treatment versus posaconazole new formulations (MoveOn)

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**Patients:** First-POSnew (*n*=5) vs First-AMB (*n*=15)  
First-AMB+POSnew (*n*=18) vs First-AMB (*n*=50)  
Salvage-POSnew (*n*=22) vs Salvage-POSsusp (*n*=42)

**Matching:** Malignancy, Surgery, Severity, Renal dysfunction

**Mortality:**

First-POSnew	40%	vs	First-AMB	60%
First-AMB+POSnew	50%	vs	First-AMB	60%
Salvage-POSnew	18%	vs	Salvage-POSsusp	33%

**Conclusion:** Posaconazole tablet or iv is effective against mucormycosis with regard to treatment response and mortality





























### Link:

[Salmanton-García et al. J Antimicrob Chemother. 2019 Nov 1;74\(11\):3315-3327.](#)

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## Prognostic factors in 264 adults with invasive *Scedosporium* spp. and *Lomentospora prolificans* infection reported in the literature and FungiScope®

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**Patients:** 208 *Scedosporium* spp., 56 *Lomentospora prolificans* cases  
(34 *Scedosporium* and 7 *Lomentospora* cases from FungiScope)  
Male 60.6 %; Median age 57 years (IQR 40 – 65)

**Risk:** Malignancy, HSCT, solid organ transplantation

**Sites:** Fungemia, lung, CNS, heart

### In vitro susceptibility:

*Scedosporium* spp.: Voriconazole (S)

*Lomentospora prolificans*: All (R)

### Mortality: Solid organ transplantation

*Scedosporium* spp.: 40% vs *Lomentospora prolificans*: 57%

#### Malignancy

*Scedosporium* spp.: 55% vs *Lomentospora prolificans*: 86%

**Conclusions:** Predictors for mortality (-) and survival (+):

#### ***Scedosporium* spp.**

Solid organ transplantation: (-) CNS, disseminated disease

Malignancy: (-) Lung

#### ***Lomentospora prolificans***

(-) Disseminated disease

(+) Surgery

### Link:

[Seidel et al. Crit Rev Microbiol. 2019 Feb;45\(1\):1-21.](#)

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# Healthcare burden of probable and proven invasive mucormycosis: a multi-centre cost-of-illness analysis of patients treated in tertiary care hospitals between 2003 and 2016

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**Patients:** 46 Mucorales  
Male 67%; Median age 53 years (range 11 – 88)

**Risk:** Malignancy, HSCT

**Mortality:** 41%

**Extra costs:**

	Invasive Mucormycosis FungiScope n=46	Control German central health care database	Difference	
Length of stay median days (IQR)	46.5 (30.3 – 83.3)	25.6 (17.9 – 40.4)	+ 20.9 (1.9 – 49.1)	days
direct treatment costs €; median (IQR)	35,765 (18,090 – 69,350)	12,587 (6,601 – 30,762)	<b>+ 23,178</b> (11,489 – 38,588)	€

**Conclusions:** Lower overall costs if

- No chemotherapy
- Surgical treatment of mucormycosis
- Antifungal prophylaxis

**Link:**







[Heimann et al. J Hosp Infect. 2019 Mar;101\(3\):339-346.](#)

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## Invasive infections due to *Saprochaete* and *Geotrichum* species: Report of 23 cases from the FungiScope Registry

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| Anupma Kindo<sup>3</sup>  | Zdenek Racil<sup>4</sup> | Judit Demeter<sup>5</sup> | Sybren De Hoog<sup>6</sup>  | Ute Aurbach<sup>7</sup>  
| Maren Ziegler<sup>7</sup> | Hilmar Wisplinghoff<sup>2,7,8</sup> | Oliver A. Cornely<sup>1,9,10,11</sup>  | FungiScope Group<sup>†</sup>

**Patients:** 23 cases, Female 48%, Median age 49 years (18 -78)

**Risk:** Malignancy, HSCT, diabetes mellitus, treatment in ICU

**Sites:** Fungemia, lung, liver, spleen, CNS

### **In vitro susceptibility:**

Amphotericin B (I)

Echinocandins (R)

Triazoles (S)

**Mortality:** 65%


**Conclusions:** Treatment with echinocandins predicts worse outcome

### **Link:**

[Durán Graeff L et al. Mycoses. 2017 Apr;60\(4\):273-279.](#)

Luisa Durán Graeff, MD

# Invasive mucormycosis in children: an epidemiologic study in European and non-European countries based on two registries

Zoi Dorothea Pana<sup>1</sup>, Danila Seidel<sup>2</sup>, Anna Skiada<sup>3</sup>, Andreas H. Groll<sup>4</sup>, Georgios Petrikos<sup>5</sup>, Oliver A. Comely<sup>2</sup>, Emmanuel Roilides<sup>1\*</sup>  and Collaborators of Zygomycosis.net and/or FungiScope™ Registries\*

**Patients:** 63 children: 34 girls, Median age: 13 years

**Risk:** Malignancy, HSCT, solid organ transplantation, trauma/surgery, diabetes mellitus

**Treatment:** 31% monotherapy AMB  
48% combination AMB  
14% no systemic antifungals  
54% + surgery

**Mortality:** 33%

**Conclusions:** Predictor for mortality (-) and survival (+)  
(-) HSCT  
(-) Disseminated IFI  
(+) Combination antifungal therapy + surgery

**Link:**

[Pana Z et al. BMC Infect Dis. 2016 Nov 10;16\(1\):667.](#)

Zoi Pana, MD

## Current Activities

- FungiScope® expanded its inclusion criteria to invasive *Aspergillus* spp. infections
- COVID-19 associated fungal infections are enrolled
- Publication on *Purpureocillium* and *Paecilomyces*-associated infections, on COVID-19 associated aspergillosis and mucormycosis
- Participation in global guidelines on clinical management of mold and yeast infections
- Prof. Yingchun Xu and Prof. Yao Wang at the Peking Union Medical College Hospital joint FungiScope® as the reference lab for the People's Republic of China
- Extending and renewal of the FungiQuest® platform [www.funquest.net](http://www.funquest.net)
- Web presence on the Research for Rare website [www.research4rare.de](http://www.research4rare.de)
- Web presence as an Expert center for rare mycosis on the Orphanet - The portal for rare diseases and orphan drugs website [www.orpha.net](http://www.orpha.net)

### ECMM Excellence Center Symposium October 10th, 2017



The University Hospital of Cologne was awarded with the ECMM Excellence Center Diamond status in 2017, certifying *Excellence* in the mycological fields of clinical microbiology and infectious diseases and acknowledging participation in ECMM endorsed clinical and epidemiological studies. The *Excellence Diamond status* was reevaluated in 2021.

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European Confederation of Medical Mycology



Center of Excellence in Clinical and  
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