Fungiscope
Rare Invasive Fungal Infection in India
Factors that are prerequisites for the development of IFI

- Exposure to fungi
- Host acquisition of potential pathogen
- Competition with microbial flora
- Disruption of skin or mucous membrane barriers
- Sufficient growth to overcome host defenses

Risk factors

- Prolonged immunosuppression (HIV/AIDS, cancer, SOT, HSCT)
- Central venous catheter, mechanical ventilation, parenteral nutrition, burns
- Diabetes mellitus
- Broad-spectrum antibiotics
**Fungiscope – Goals**

- Collect epidemiological and clinical data on invasive infections caused by emerging fungal pathogens
- Provide data for analysis of risk factors and treatment strategies to guide treatment recommendations
- Build a biobank of emerging fungi
- Collaborate with other groups for joint analyses
Improvement in the outcome of invasive fusariosis in the last decade


- N=233 cases
- 11 countries
- Death associated with:
  - Corticosteroids (HR 2.11, 95% CI 1.18–3.76, p 0.01)
  - Persistent neutropenia (HR 2.70, 95% CI 1.57–4.65, p <0.001)
  - D-AmB (HR 1.83, 95% CI 1.06–3.16, p 0.03)
Eligibility Criteria

Inclusion

Invasive fungal infection documented by at least one of the following

- Culture
- Histology
- Antigen detection
- PCR-based detection of fungal DNA

Exclusion

- Infection due to *Aspergillus*, *Candida*, *Cryptococcus neoformans*, *Pneumocystis jiroveci*
- Endemic fungal infection such as coccidioidomycosis or histoplasmosis
- Colonisation or other non-invasive infection
www.fungiscope.net

Registration and Password Acquisition
register@fungiscope.net

Electronic Case Report Form

Diagnostics
FungiThek
Culture/Biopsy
Banking
FungiQuest
Database
Search
Therapeutic
Drug
Monitoring
Statistical
Analysis
Add a new patient

Start the survey

✔ Risk Factors
✔ Diagnostic Procedures
✔ Clinical Signs and Symptoms
✔ Site of Infection
✔ Mycological Evidence
✔ Treatment
✔ Outcome
**Fungiscope – Quality Control**

- **Fungiscope Partners** from 58 countries
- Active Partner: $N_{IFI}=522$
- Other registries: $N_{IFI}=84$
- Investigator: $N_{IFI}=606$
- Medical Documentalist: 60% (30%)
- ID Specialist: 404 valid
- FungiThek: $N_{Isolate}=104$
- FungiQuest
Fungiscope™

FungiThek

Diagnosis of rare IFI

Central storage of isolates

Diagnostic laboratories

Macroscopic and microscopic identification

Sequencing

Mass Spectrometry

Reference database

Link specimens to clinical and demographic data

Manage requests for specimen use
Diagnosis of rare IFI

www.fungiquest.net
Search the database

Browse through cases

FungiScope® is a global research project of the German Mycological Society, the ISHAM, the ECM, and other international mycological societies. We collect clinical characteristics, culture and tissue samples of patients with rare fungal diseases. The aim is to create a network of interested researchers, allowing them to share experiences and samples to ultimately improve diagnosis and treatment of these rare infections.

If you’d like further information on the project or would like to register, visit our site www.fungiquest.net.

Looking for a specific pathogen? Search our database through FungiQuest™ now! Or jump directly to some of our interesting cases, e.g. Rhizopus, Fusarium, Scedosporium, or Trichosporon.

When searching e.g. for Lichtheimia, remember aliases, in this case Absidia and Mycocladus, to retrieve information on older cases.

Note: Search query must contain at least 5 characters.

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Risk Factors</th>
<th>Site</th>
<th>Empirical Agents</th>
<th>Targeted Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusarium solani</td>
<td>Diabetes mellitus</td>
<td>Eyes</td>
<td>Voriconazole, Liposomal_amphotericin_B, Caspofungin</td>
<td></td>
</tr>
<tr>
<td>Fusarium solani</td>
<td>Hematopoietic stem cell transplantation (HSCT)</td>
<td>Deep soft tissues, e.g. muscles, Skin, Disseminated</td>
<td>Voriconazole</td>
<td></td>
</tr>
</tbody>
</table>

Search the FungiScope® database for: Fusarium

Search query must contain at least 5 characters.
Please note that we are currently rebuilding our database and that FungiQuest™ therefore only provides information on about 30% of our cases. Also note that some of these cases were transferred from an older version of our database and not all information has yet been correctly formatted.

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<table>
<thead>
<tr>
<th>ID</th>
<th>Pathogen</th>
<th>Culture</th>
<th>PCR</th>
<th>Risk Factors</th>
<th>Site</th>
<th>Empirical Agents</th>
<th>Targeted Agents</th>
<th>Surgery</th>
<th>Response</th>
<th>Survived</th>
<th>Last observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Fusarium solani</td>
<td>X</td>
<td></td>
<td>Diabetes mellitus</td>
<td>Eyes</td>
<td>Other: _Please specify, Fluconazole</td>
<td>therapeutic keratoplasty</td>
<td>Stable</td>
<td>Yes</td>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Fusarium solani</td>
<td>X</td>
<td></td>
<td>Hematopoietic stem cell transplantation (HSCT)</td>
<td>Deep soft tissues, e.g. muscles, Skin, Disseminated</td>
<td>Voriconazole, Liposomal_amphotericin_B, Caspofungin</td>
<td>Voriconazole</td>
<td>No</td>
<td>Deterioration_or_failure</td>
<td>No</td>
<td>2010</td>
</tr>
<tr>
<td>32</td>
<td>Fusarium aqueductum</td>
<td>X</td>
<td></td>
<td>Chronic pulmonary disease, Diabetes mellitus</td>
<td>Lungs, Disseminated</td>
<td>Voriconazole, Voriconazole</td>
<td>No</td>
<td>Partial_response</td>
<td>Yes</td>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Fusarium species</td>
<td>X</td>
<td></td>
<td>Diabetes mellitus</td>
<td>Deep soft tissues, e.g. muscles, Disseminated</td>
<td>surgical debridement</td>
<td>Unknown</td>
<td>Yes</td>
<td>2007</td>
<td></td>
<td></td>
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<tr>
<td>34</td>
<td>Fusarium solani</td>
<td>X</td>
<td></td>
<td>Chemotherapy, Hematopoietic stem cell transplantation (HSCT), Diabetes mellitus</td>
<td>Bloodculture, Bones, Deep soft tissues, e.g. muscles, Lungs, Disseminated</td>
<td>Liposomal_amphotericin_B, Voriconazole</td>
<td>No</td>
<td>Deterioration_or_failure</td>
<td>No</td>
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<td>35</td>
<td>Fusarium dimerum</td>
<td>X</td>
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<td>Major surgery (not including surgery as part of antifungal therapy), Chronic renal</td>
<td>Lungs, Disseminated</td>
<td></td>
<td>No</td>
<td>Complete_response</td>
<td>Yes</td>
<td>2009</td>
<td></td>
</tr>
</tbody>
</table>
Partner Sites in India

- Chandigarh
- New Delhi
- Ahmedabad
- Mumbai
- Pune
- Manipal
- Bengaluru
- Chennai
- Tiruchirapalli
- Kolkata
Central Laboratory in India

Anuradha Chowdary
Vallabhbhai Patel Chest Institute
Department of Medical Mycology
University of Delhi
Delhi

dranuradha@hotmail.com
Fungiscope™

404 Valid Cases from 24 Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>111</td>
</tr>
<tr>
<td>India</td>
<td>77</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>52</td>
</tr>
<tr>
<td>Russia</td>
<td>37</td>
</tr>
<tr>
<td>France</td>
<td>19</td>
</tr>
<tr>
<td>Austria</td>
<td>18</td>
</tr>
<tr>
<td>Italy</td>
<td>18</td>
</tr>
<tr>
<td>Canada</td>
<td>16</td>
</tr>
<tr>
<td>Brazil</td>
<td>14</td>
</tr>
<tr>
<td>Slovakia</td>
<td>13</td>
</tr>
<tr>
<td>Israel</td>
<td>5</td>
</tr>
<tr>
<td>Belgium</td>
<td>3</td>
</tr>
<tr>
<td>Hungary</td>
<td>3</td>
</tr>
<tr>
<td>Romania</td>
<td>3</td>
</tr>
<tr>
<td>Turkey</td>
<td>3</td>
</tr>
<tr>
<td>Croatia</td>
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</tr>
<tr>
<td>Croatia</td>
<td>2</td>
</tr>
<tr>
<td>Australia</td>
<td>1</td>
</tr>
<tr>
<td>Cuba</td>
<td>1</td>
</tr>
<tr>
<td>Denmark</td>
<td>1</td>
</tr>
<tr>
<td>Finland</td>
<td>1</td>
</tr>
<tr>
<td>Greece</td>
<td>1</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>1</td>
</tr>
<tr>
<td>USA</td>
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</tbody>
</table>
### 404 Cases – Demographic Features

#### Cases (n)

<table>
<thead>
<tr>
<th>Category</th>
<th>India n=77</th>
<th>Other n=327</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>287</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaska Native</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Sub-Saharan African/Afro-American</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>North African</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Arabic</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

#### Demographic Features

- **Median Age**: 48 (India) vs. 51 (Other)
- **Age Min-Max**: 2-78 (India) vs. 0-83 (Other)
- **Gender (Female %)**: 26 (India) vs. 37 (Other)
- **Weight (kg)**: 63 (India) vs. 69 (Other)
- **Height (cm)**: 163 (India) vs. 170 (Other)
327 cases from countries other than India

- Mucoromycotina: 53%
- Fusarium: 16%
- Dematiaceae: 40%
- Penicillium/Paecilomyces: 4%
- Yeast: 13%
- Scedosporium: 4%
- Other: 6%

77 cases from India

- Mucoromycotina: 14%
- Fusarium: 13%
- Yeast: 11%
- Penicillium/Paecilomyces: 5%
- Dematiaceae: 40%
- Other: 13%
Risk Factors in 327 Cases (other than India)

- Chemotherapy: 50%
- HSCT: 15%
- ICU stay: 20%
- Diabetes mellitus: 10%
- Chronic pulmonary disease: 5%
- Chronic renal disease: 5%
- Major surgery: 5%
- Alcoholism: 5%
- Trauma: 5%
- Chronic liver disease: 5%
- HIV/AIDS: 5%
- No risk factor identified: 5%

Other (n=327)
Risk Factors

India (n=77) vs Other (n=327)
Site of Infection (other than India)

- Lungs
- Blood
- Skin
- Paranasal sinus(es)
- Deep soft tissues
- CNS
- Bones
- Gastrointestinal tract
- Eyes
- Liver
- Spleen
- Kidneys
- Peritoneum
- Genitourinary tract
- Biliary system
- Disseminated

Other (n=327)
**Site of Infection**

- **Lungs**
- **Blood**
- **Skin**
- **Paranasal sinus(es)**
- **Deep soft tissues**
- **CNS**
- **Bones**
- **Gastrointestinal tract**
- **Eyes**
- **Liver**
- **Spleen**
- **Kidneys**
- **Peritoneum**
- **Genitourinary tract**
- **Biliary System**
- **Disseminated**

**India (n=77)**

**Other (n=327)**

%
**Treatment**

- **Prophylaxis**
  - Mucoromycotina
  - Fusarium
  - Yeast
  - *Penicillium/Paecilomyces*
  - Dematiaceae
  - *Scedosporium*
  - Other

- **Empiric**
  - Mucoromycotina
  - Fusarium
  - Yeast
  - *Penicillium/Paecilomyces*
  - Dematiaceae
  - *Scedosporium*
  - Other

- **Targeted**
  - Mucoromycotina
  - Fusarium
  - Yeast
  - *Penicillium/Paecilomyces*
  - Dematiaceae
  - *Scedosporium*
  - Other

- **India (n=77)**
  - Mucoromycotina
  - Fusarium
  - Yeast
  - *Penicillium/Paecilomyces*
  - Dematiaceae
  - *Scedosporium*
  - Other

- **Other (n=327)**
  - Mucoromycotina
  - Fusarium
  - Yeast
  - *Penicillium/Paecilomyces*
  - Dematiaceae
  - *Scedosporium*
  - Other

*Fungiscope™*
Favorable Outcome

- Mucoromycotina
- *Fusarium*
- Yeast
- *Penicillium/Paecilomyces*
- Dematiaceae
- *Scedosporium*
- Other

- India (n=77)
- Other (n=327)
Overall Mortality

- Mucoromycotina
- Fusarium
- Yeast
- *Penicillium/Paecilomyces*
- Dematiaceae
- *Scedosporium*
- Other

India (n=77)
Other (n=327)
Conclusion

Fungiscope provides

• A platform for fruitful collaboration
• Efficient method for collecting patient information
• Immediate diagnostic and therapeutic services
Global Emerging Fungal Infection Registry
Initiated in 2003
ISHAM and ECMM Working Group
www.fungiscope.net

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Chair
O.A. Cornely

Coordination
D. Seidel
M.J.G.T. Vehreschild
K. Wahlers

Clinicalsurveys.net
J.J. Vehreschild

Documentation
F. Müller

Culture Banking
H. Wisplinghoff

Molecular Biology
S. De Hoog
V. Rickerts

Histopathology
B. Markiefka

Thoracic Surgery
K. Hekmat

Pharmacokinetics
F. Farowski
Become a Fungiscope Collaborator

Global Emerging Fungal Infection Registry
Initiated in 2003
ISHAM and ECMM Working Group
www.fungiscope.net

Send an Email to register@fungiscope.net
to contribute your rare cases of invasive fungal infection

e.g. Acremonium, Alternaria, Bipolaris, Cladosporium, Cryptococcus other than neoformans, Curvularia, Exophiala, Fusarium, Geotrichum, Paecilomyces, Penicillium, Phialophora, Scedosporium, Trichoderma, Trichosporon