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UK NEQAS Benefits of an EQA Performance in the Last Decade

Shila Seaton

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The United Kingdom National External Quality Assessment Service

- Mycology scheme introduced in 1986
- Need for an EQA with the increasing number of laboratories providing a service for isolation and identification
- Antifungal susceptibility scheme introduced in 2005 (pilot) for assessing susceptibilities against the most common antifungal agents.

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Benefits

Mycology EQA scheme provides participants with the opportunities:

- To assess their performance with culture and identification for a variety of clinically significant fungi from superficial and deep infections.
- An educational aspect, allowing participants to gain experience with genera and species of fungi less commonly encountered in their laboratory.
- For inter laboratory assessment
- To learn from any failures, whilst correct results demonstrate that suitable methods and techniques are being employed.
- Highlight areas in need of improvement

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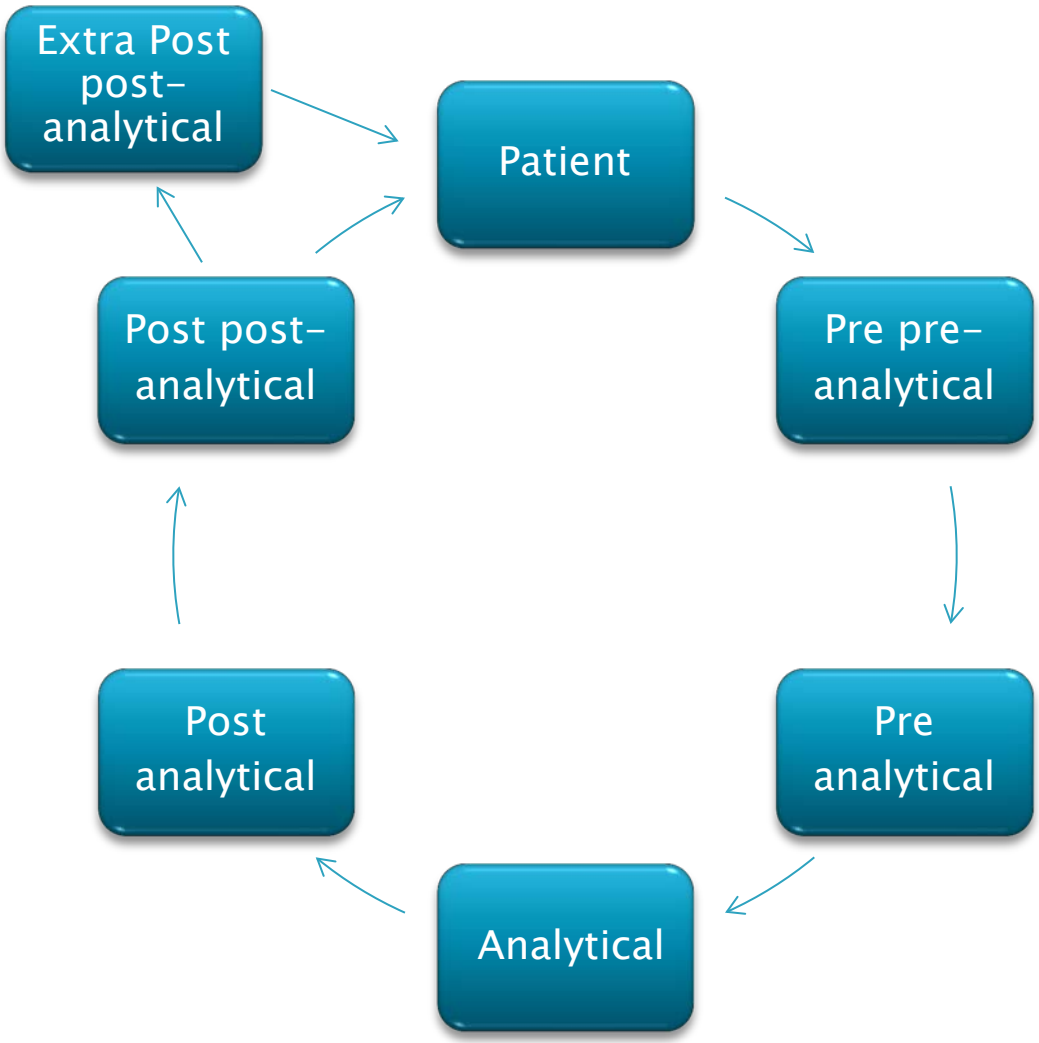
Total Testing Process



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Analytical errors

- Sample mix up
- Inappropriate tests carried out
- Diagnostic tests performed incorrectly
- Automation failure
- Mis-identification of the intended organism
- Report the contaminant(s)

Post analytical errors

1. Post analytical data entry error—transcription error
2. Turn around times- date results entered onto the web
3. Clinician or other provider fails to retrieve test result -non return
4. Failure to communicate critical value
5. Provider misinterprets lab result
6. Misinterpretation of results
7. Oral miscommunication of results

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Performance

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2004-2014

- 120 fungal isolates were dispatched as panels of four specimens, distributed three times per year.
- Specimens encompassed over 50 species of filamentous fungi and >15 species of yeasts.
- Isolates included the most common dermatophytes, non-dermatophytes, opportunistic moulds and emerging pathogens

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Results

- Data sets (ranging from 413 participants in 2002 to 389 in 2014), (UK labs from 151 in 2002 to 160 in 2014) of results entered by participants were analysed.
- Results showed a range of outcomes from good performance for fungal identification:
- Dependant on the genus and species of fungus distributed
- Significant mis-identifications of some fungi

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Dermatophytes

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Organism ID	Year	Distribution number	Correct identity (%)	Incorrect species (%)	Incorrect genus (%)	No. of participants
Epidermophyton floccosum	2008	2370	50	-	19	395
	2010	2588	86	-	12	372
	2012	3132	92	-	6.8	399
Trichophyton rubrum	2004	1765	81	9.6	3.1	324
	2007	2223	80	13.3	2.9	407
	2010	2656	74*	21.6	1.5	408
	2010	2703	84	11.1	3	405
	2013	3253	77**	12	2.2	401
	2014	3577	89.3	5.6	0.5	391
Trichophyton mentagrophytes / interdigitale	2004	1806	89	6.7	3.2	401
	2007	2133	54	32.5	5.9	422
	2012	3017	78	13.3	5.1	392
	2013	3309	91	5.9	2.5	407
	2014	3577	60*	29.9	2.9	388
Trichophyton tonsurans	2002	1581	69	29.2	2.2	368
	2005	1943	76	21	2	412
	2009	2414	70	25.7	3.1	416
	2012	3017	84	13.7	2.8	393

Trichophyton rubrum

UK labs

Organism ID	Year	Distribution number	Correct identity (%)	Incorrect species (%)	Incorrect genus (%)	No. of participants
Trichophyton rubrum	2004	1765	85.7	8.6	1.7	175
	2007	2223	91.1	7.9	0	190
	2010	2656	74*	23.5	1.1	183
	2010	2703	93.9	4.4	0.6	181
	2011	2902	84	11.1	0.6	171
	2013	3253	86.1*	10.1	1.9	159
	2014	3577	97.5	2	0.5	151

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Variants

- A melanin producing *T. rubrum* strain was distributed in 2010 and characterisation of this variant proved difficult for some participants, resulting in only 74% of laboratories reporting the correct result
- Granular form of *T. rubrum* in 2013 resulted in 77% by all labs but 86% by UK labs.
- Nodular variant of *T. interdigitale* distributed in the most recent distribution resulting in 60% correct identification

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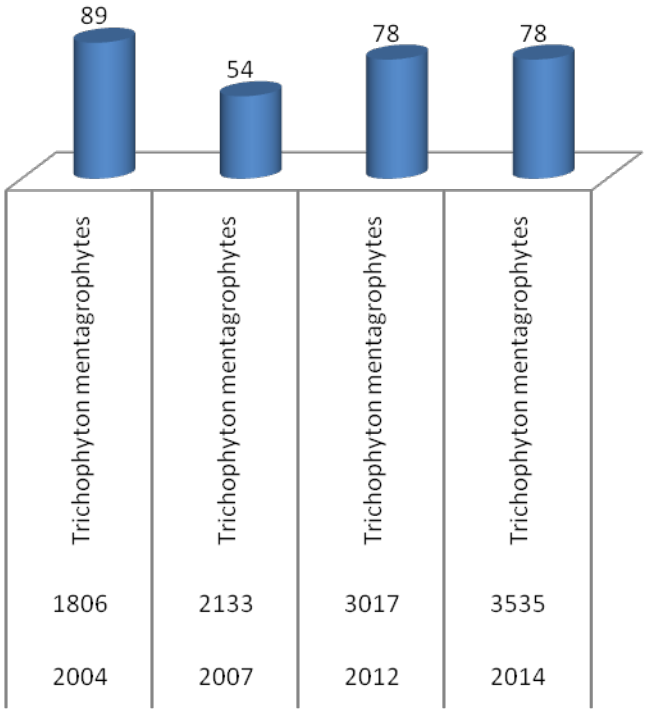
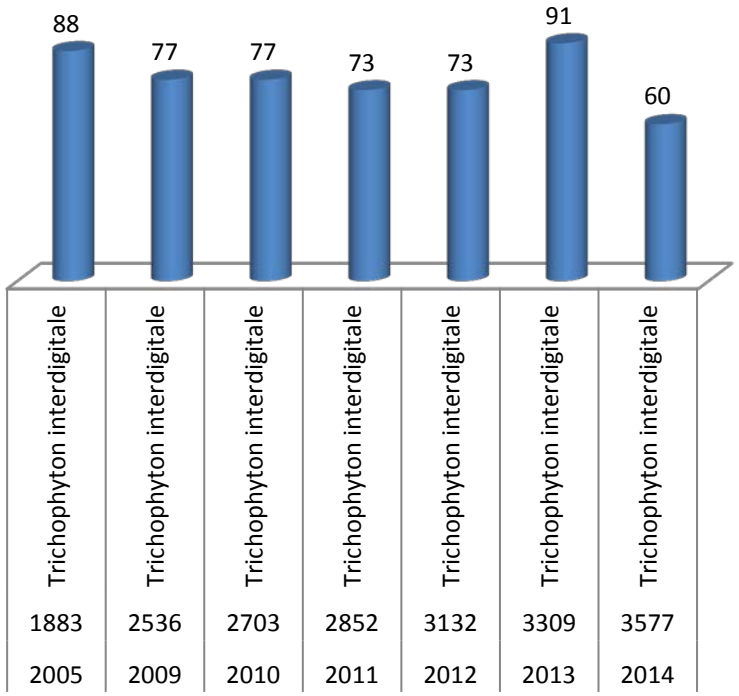
T. interdigitale/mentagrophytes

***T. mentagrophytes*/ % correct ID**



***T. interdigitale*/ %correct ID**



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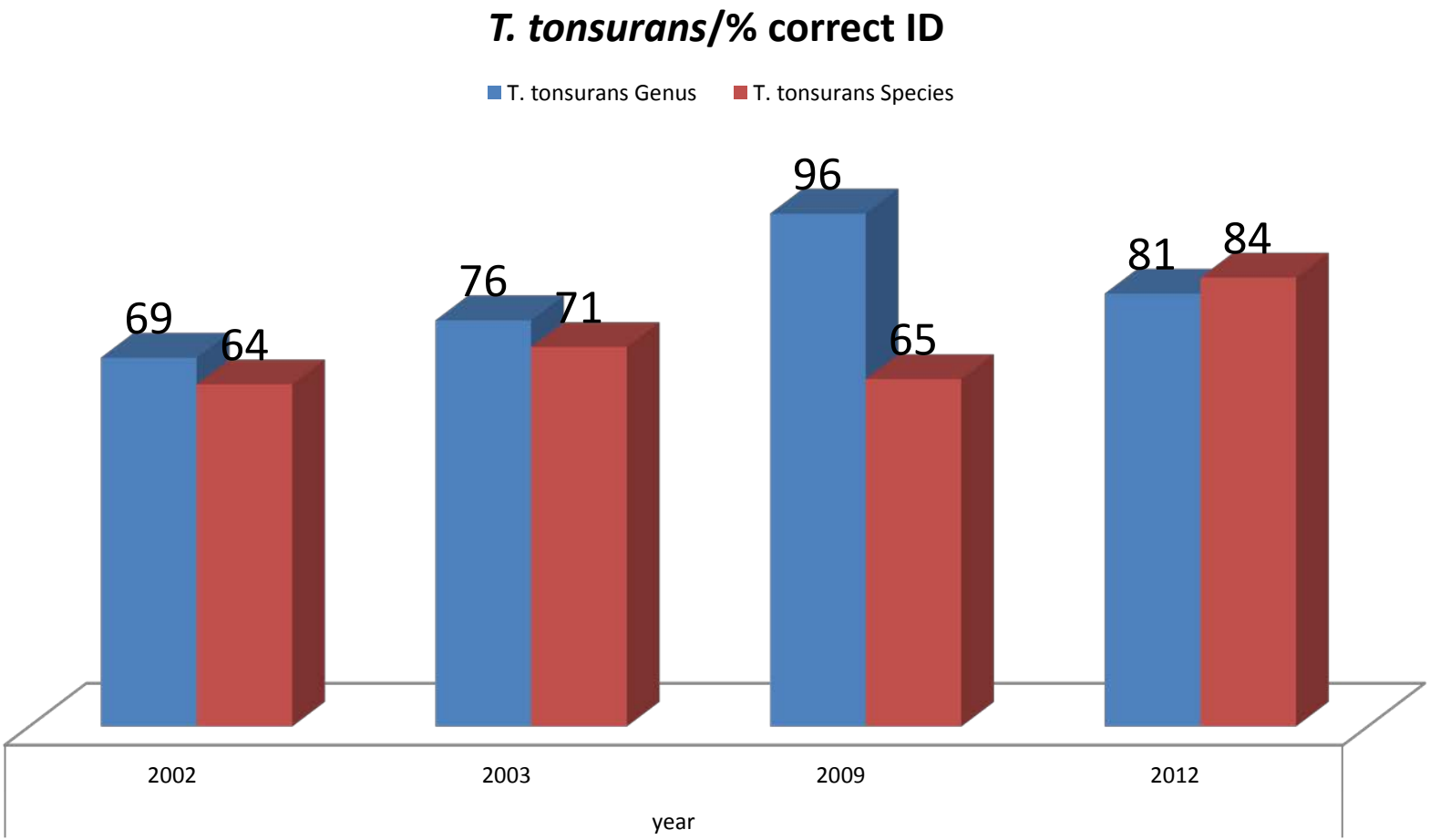
Trichophyton tonsurans



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Microsporum species

Organism ID	Year	Distribution number	Correct identity (%)	Incorrect species (%)	Incorrect genus (%)	No. of participants
Microsporum canis	2002	1558	85	6.9	7.2	349
	2008	2275	87	5.4	5.2	405
	2011	2757	71	6.3	20.7	416
	2012	2957	82	6.3	20.7	416
Microsporum gypseum	2004	1806	83	8	7	400
	2009	2488	72	10.4	11.6	413
	2013	3253	93.4	2.8	2.5	393

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Non dermatophytes

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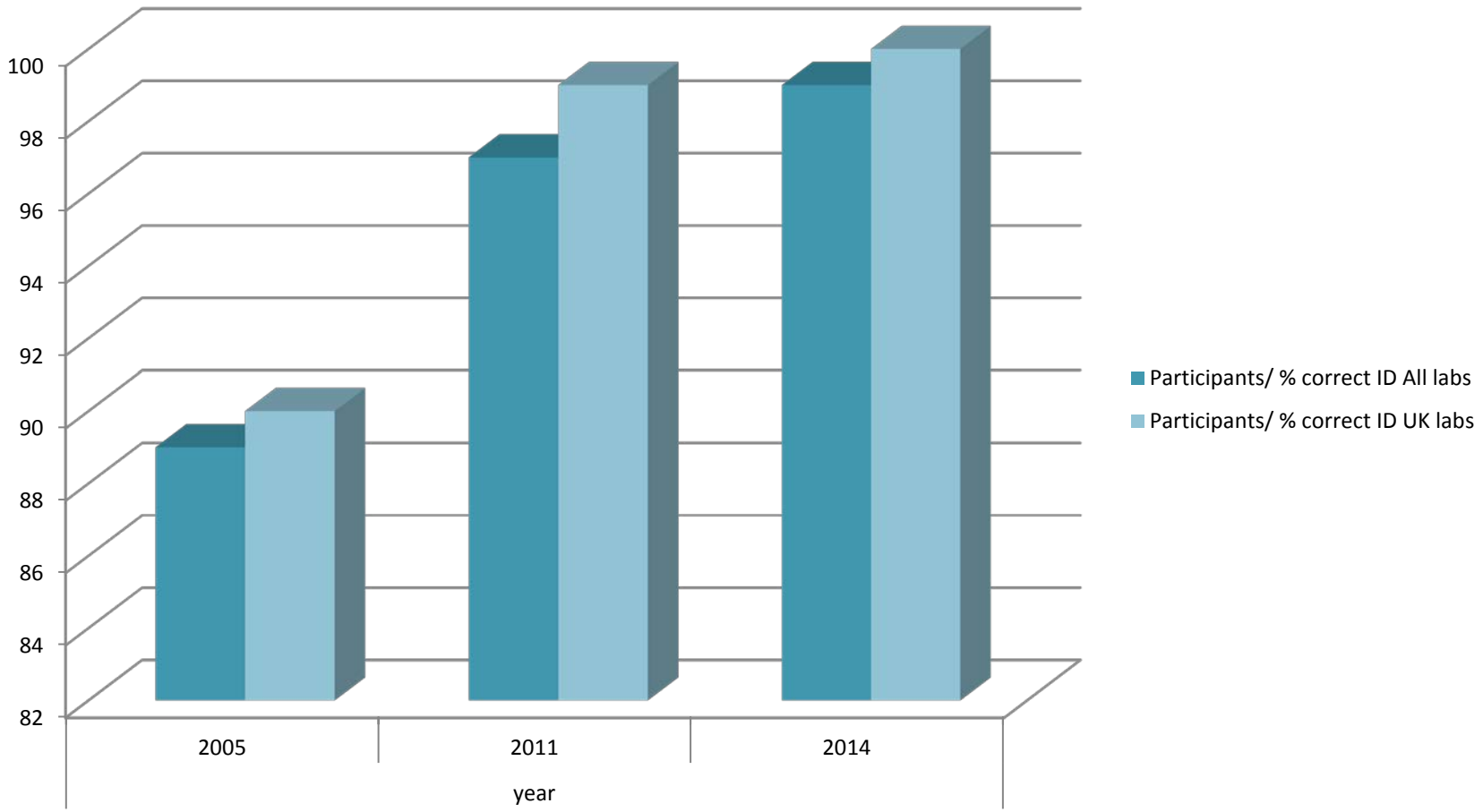
Scopulariopsis brevicaulis



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Opportunistic moulds

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Opportunistic moulds

- Aspergillus species cause a range of infections: superficial infections to deep seated infections
- Onychomycosis to invasive Aspergillus disease
- Why distribute Aspergillus species so frequently?
- Need to be able to differentiate between the species for appropriate diagnosis and antifungal treatment

Table 1. *Aspergillus* species distributed over the 10 year period

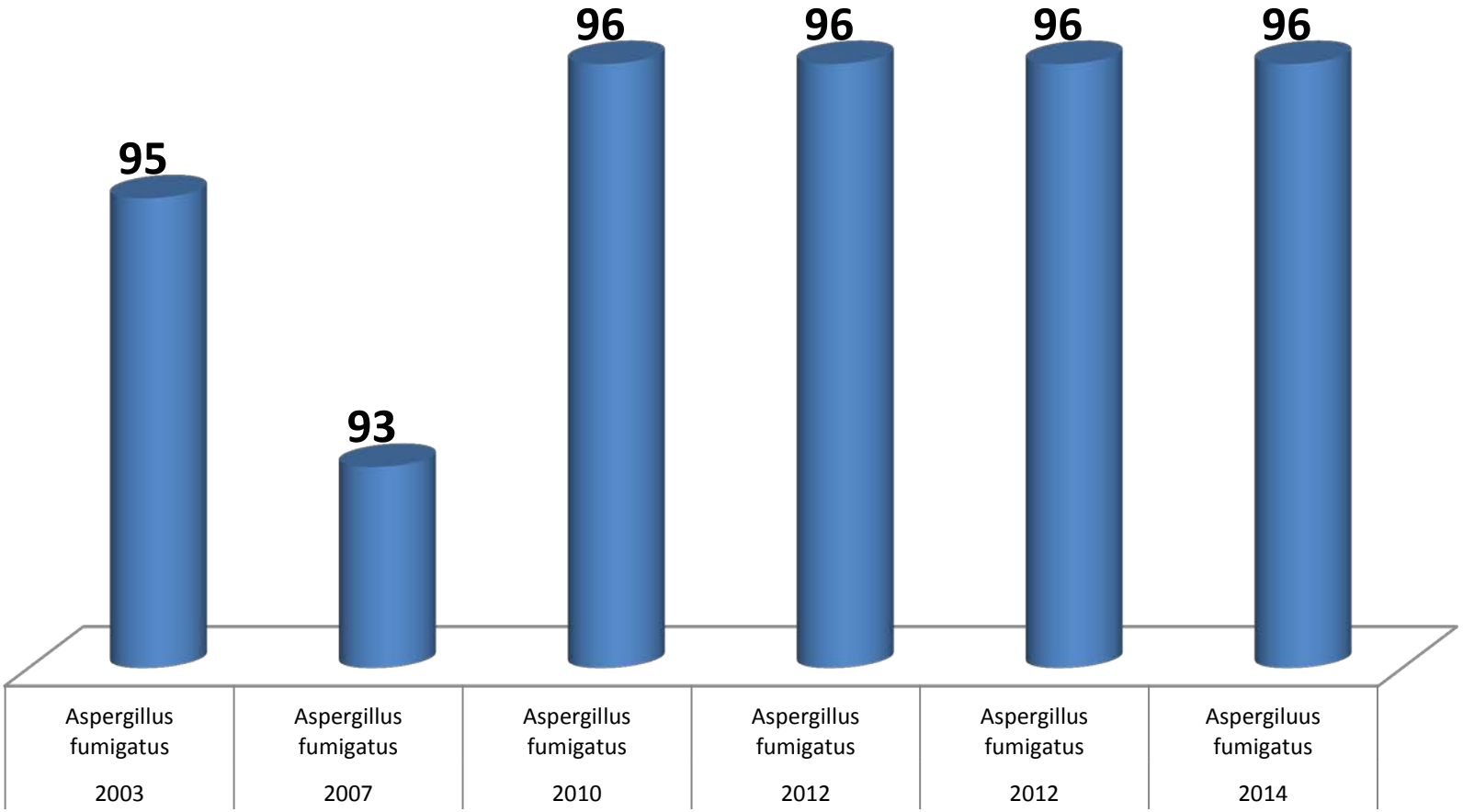
Intended organism *Aspergillus* species complex	Year of distribution	Distribution Number	Correct identity report (%)	Incorrect species (%)	Incorrect genus (%)	No. of participants
Aspergillus fumigatus	2003	1609	95	3.3	-	392
	2007	2133	93	4.7	1.3	429
	2010	2588	96	2.1	0.5	429
	2012	2957	96	2.2	1.0	410
	2012	3132	96	2.0	1.0	403
Aspergillus flavus	2003	1655	89	7.7	0.8	388
	2007	2185	87	10.4	-	402
	2011	2852	86	10	0.7	408
Aspergillus terreus	2002	1558	86	9.5	0.9	349
	2011	2757	92	3.1	0.9	422
Aspergillus versicolor	2002	1581	79	16	4	369
	2008	2275	76	16	8	406
	2009	2488	68	8	22*	412
	2012	3017	86	9	5	392
Aspergillus niger	2008 2013	2370 3253	99 99	0.2 0.2	0.2 0,2	415 413

Less common Aspergillus species

Organism ID	Year	Distribution number	Correct identity (%)	Incorrect species (%)	Incorrect genus (%)	No. of participants
Aspergillus nidulans	2006	2085	73	24.2	2.7	409
	2011	2902	79	19	1.9	411
Aspergillus clavatus	2004	1765	86	9.8	1.3	389
Aspergillus glaucus	2006	1986	66	26.8	2.5	406
	2010	2703	78	20	4.2	413
Aspergillus candidus	2010	2656	96	6.1	6.6	408
	2015	3535	94	4.3	2	397

Aspergillus fumigatus species complex

***A. fumigatus* species complex/% correct ID**



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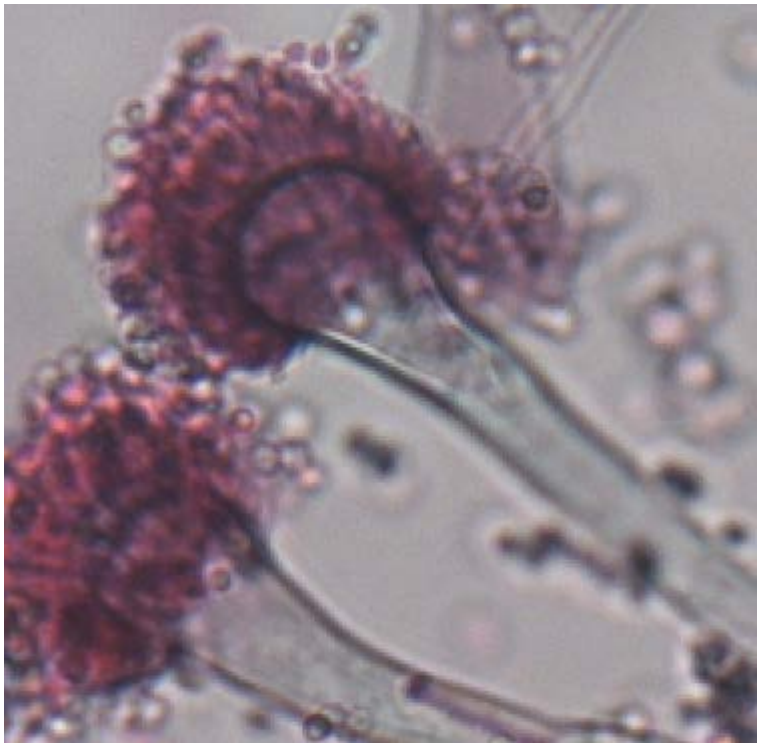
Microscopy

Aspergillus flavus species complex



Aspergillus fumigatus species complex

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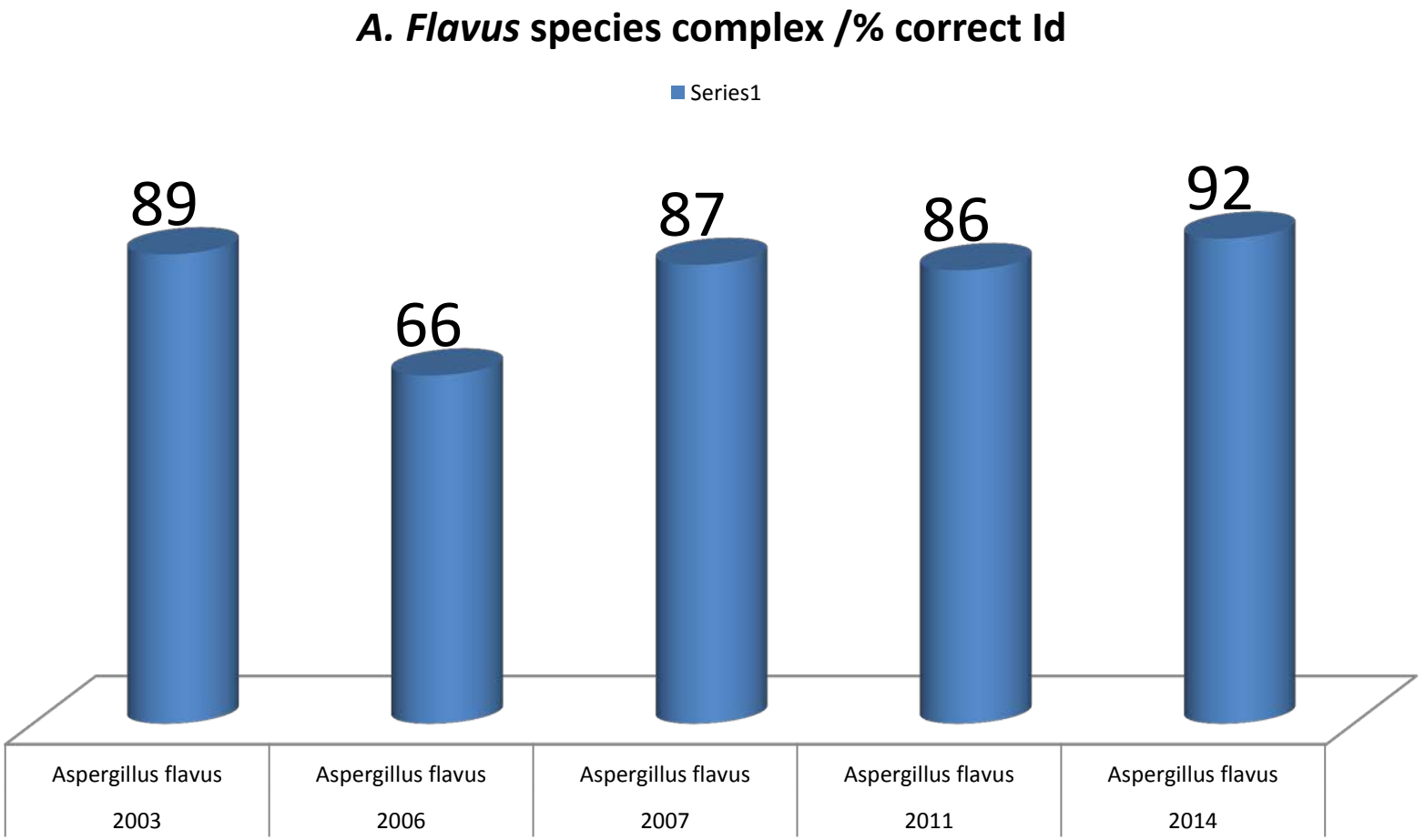
Aspergillus flavus species complex



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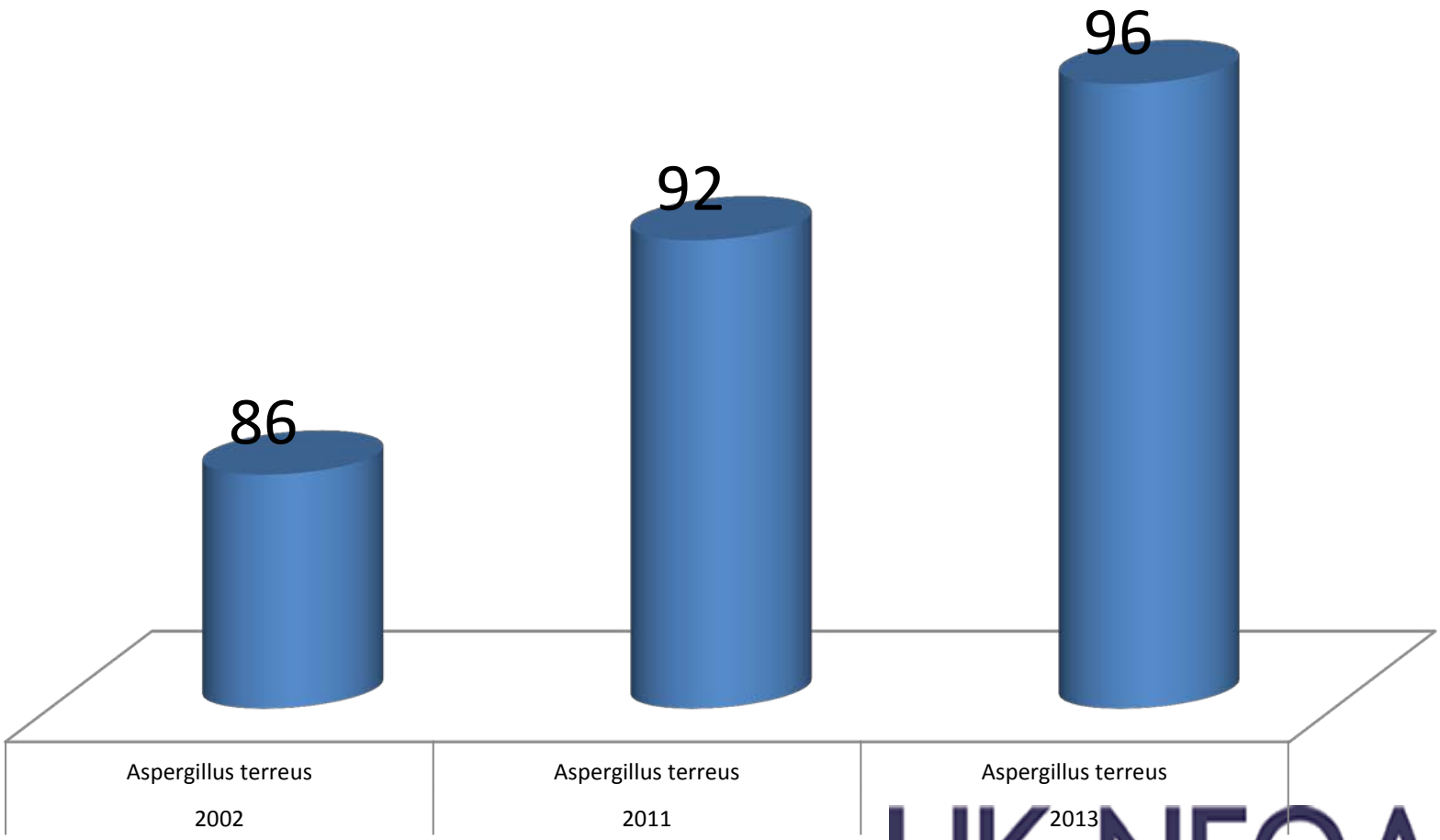
Aspergillus terreus species complex

***Aspergillus terreus* species complex /% correct ID**



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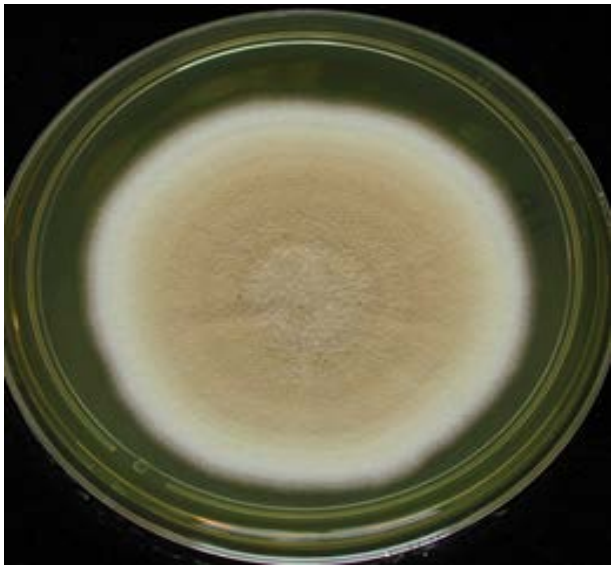
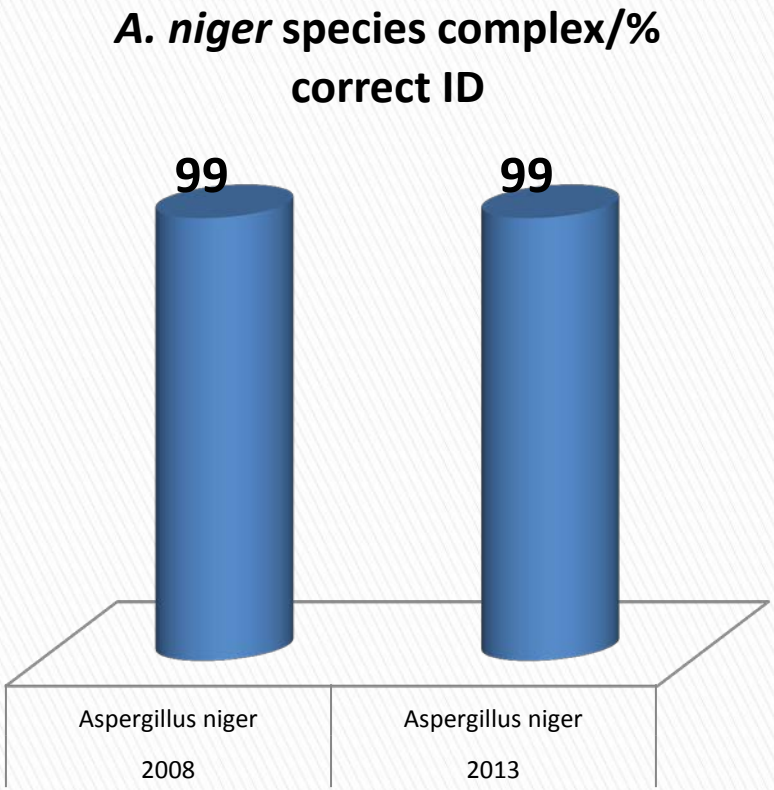
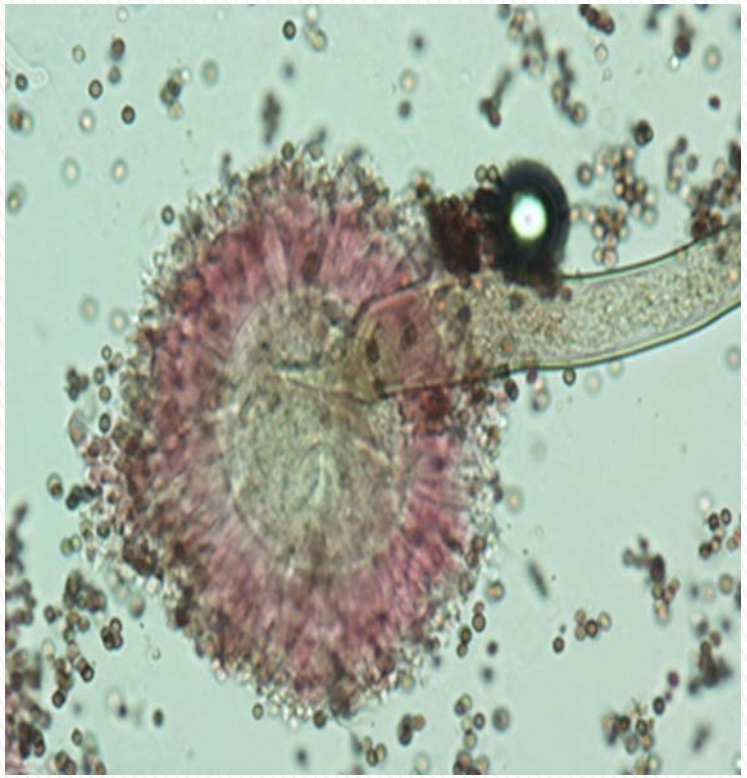
Phenotype –Microscopy



Aspergillus terreus species complex

Aspergillus niger species complex





Performance over 2 distributions

Microscopy: A. niger

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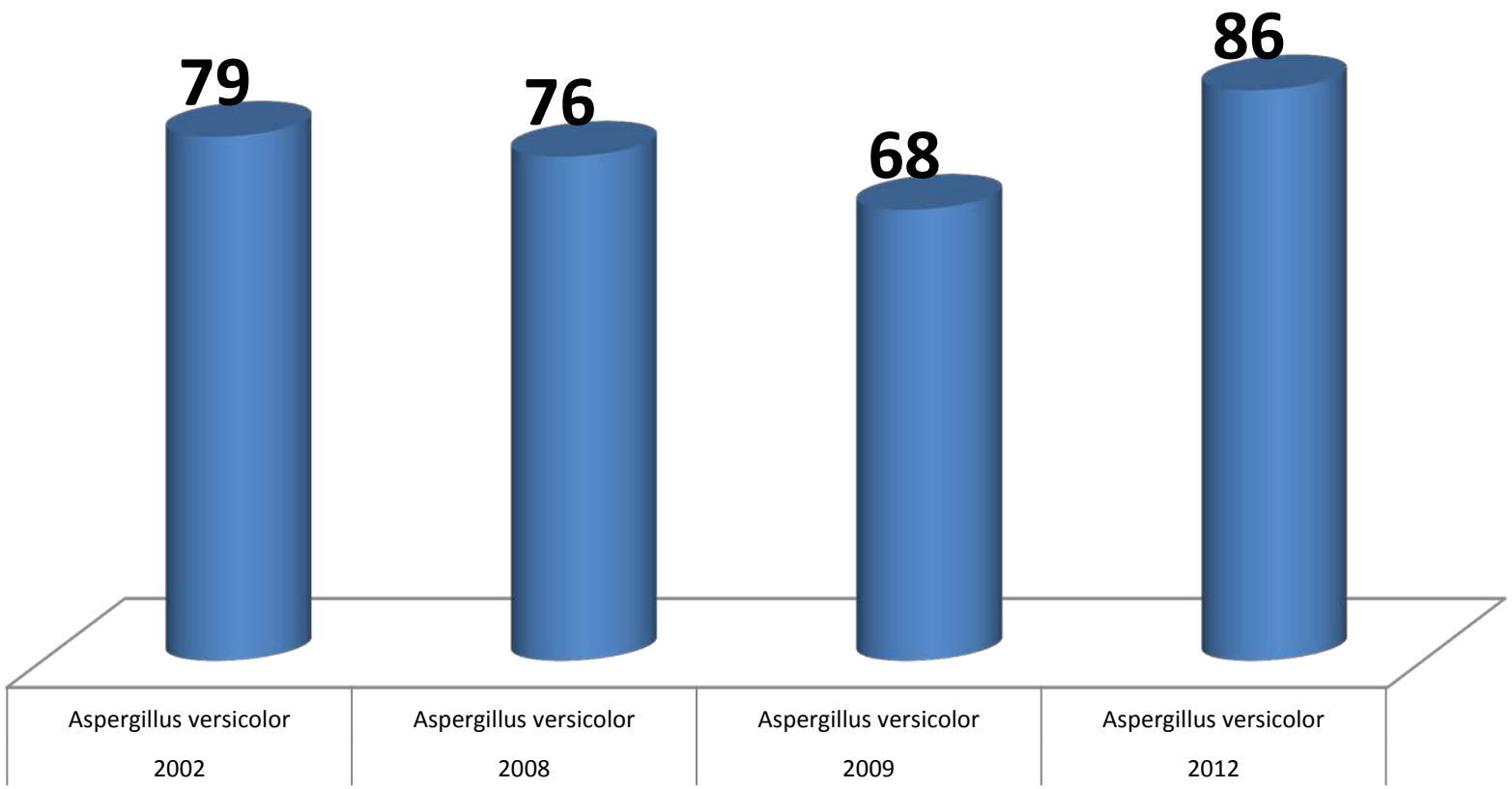
Aspergillus versicolor species complex

A. *versicolor* species complex/ % correct ID



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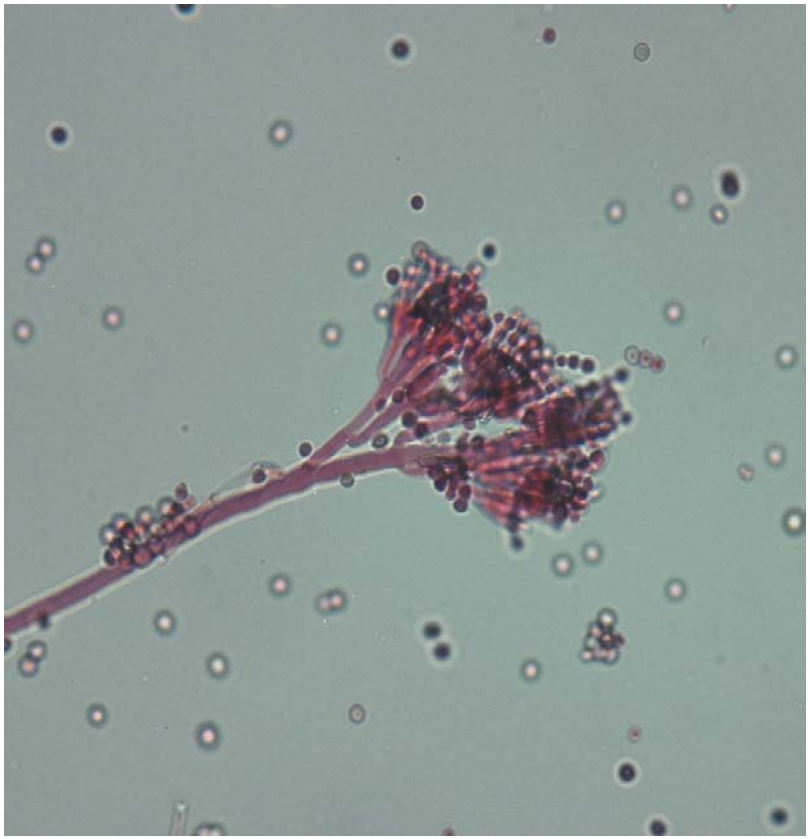
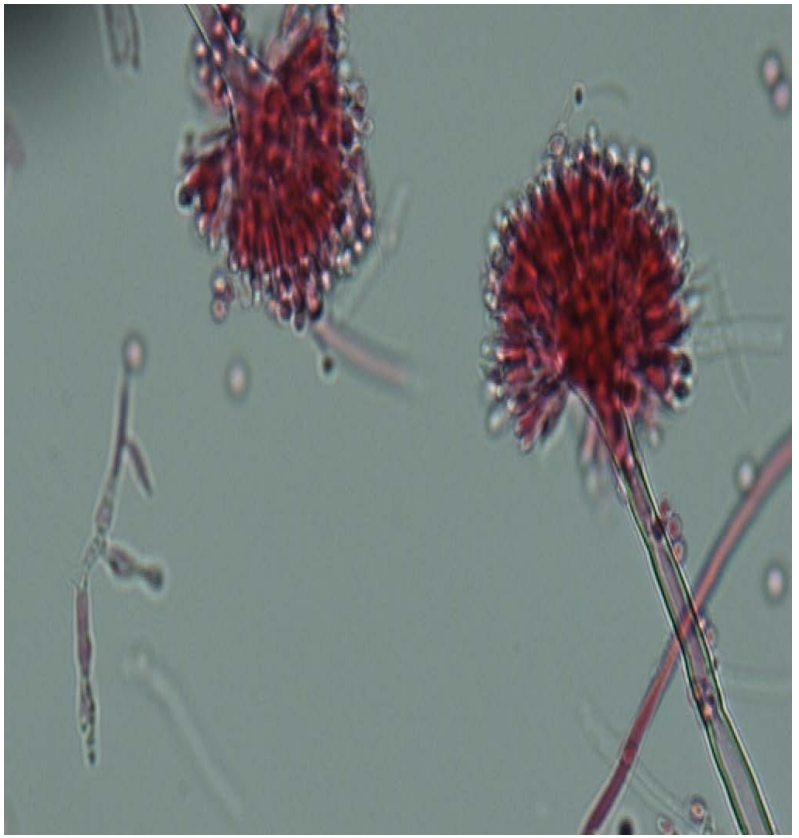
Microscopy



Penicillium spp



Aspergillus versicolor

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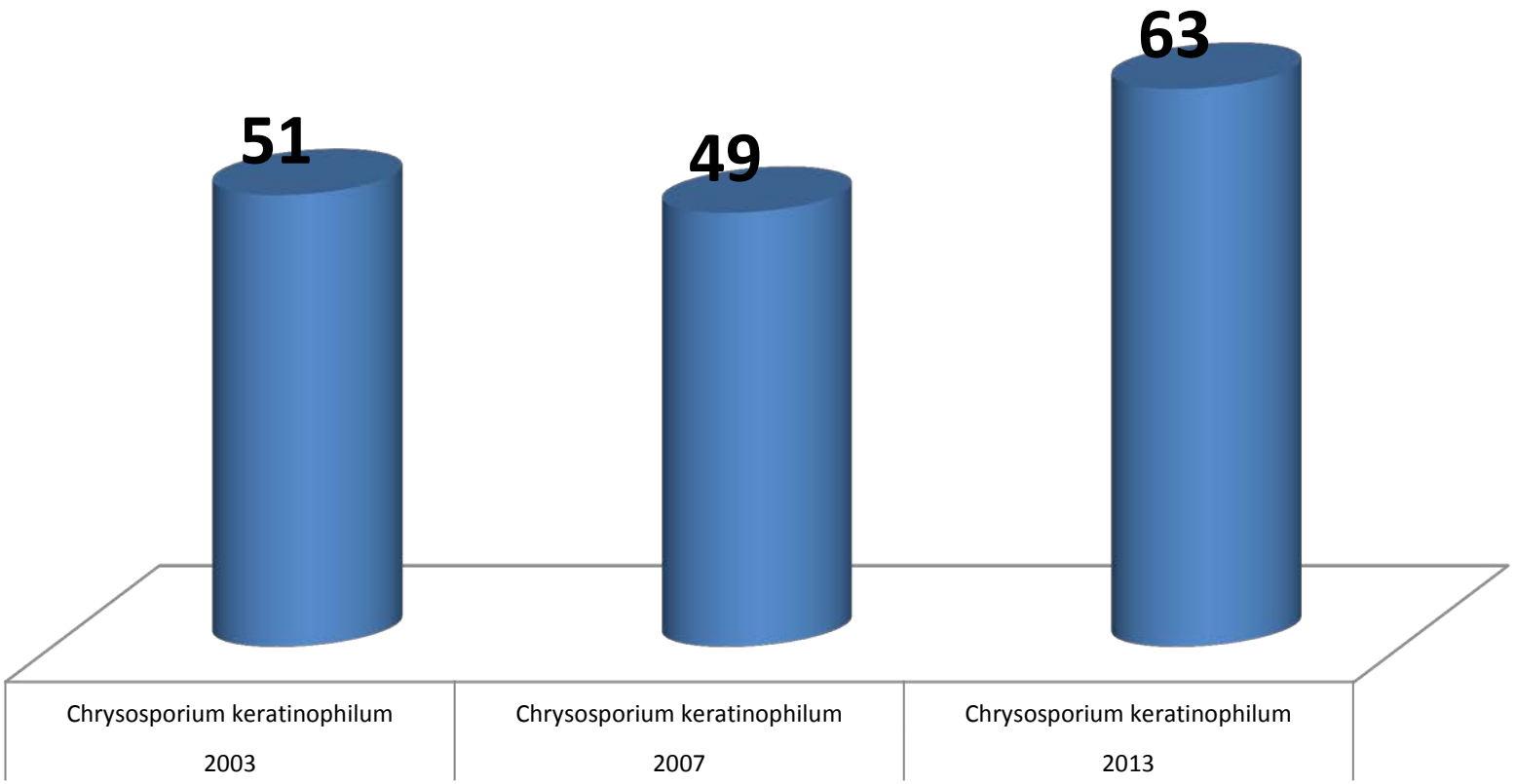
Saprophytic fungi

***Chrysosporium keratinophilum*/% correct ID**



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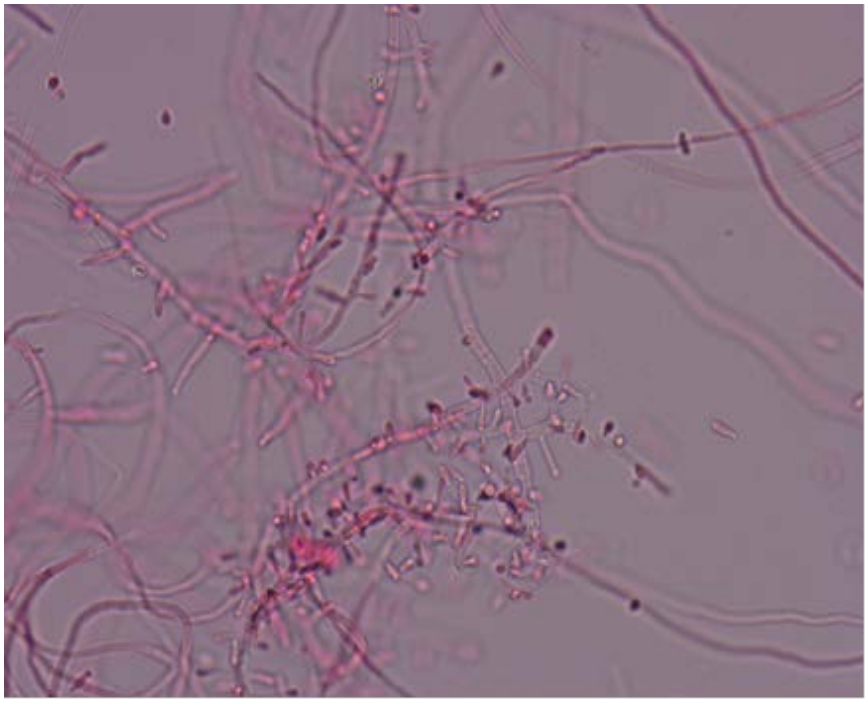
Microscopy

Chrysosporium keratinophilum



Trichophyton tonsurans

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Scedosporium & Lomentospora species

Significant mis-identification or insufficient identification, which could ultimately result in inappropriate antifungal treatment, is illustrated with a *Lomentospora (Scedosporium) prolificans* distributed in 2005

- 50% of participants reported to genus level only
- 34% incorrectly identified the isolate as *S. apiospermum*

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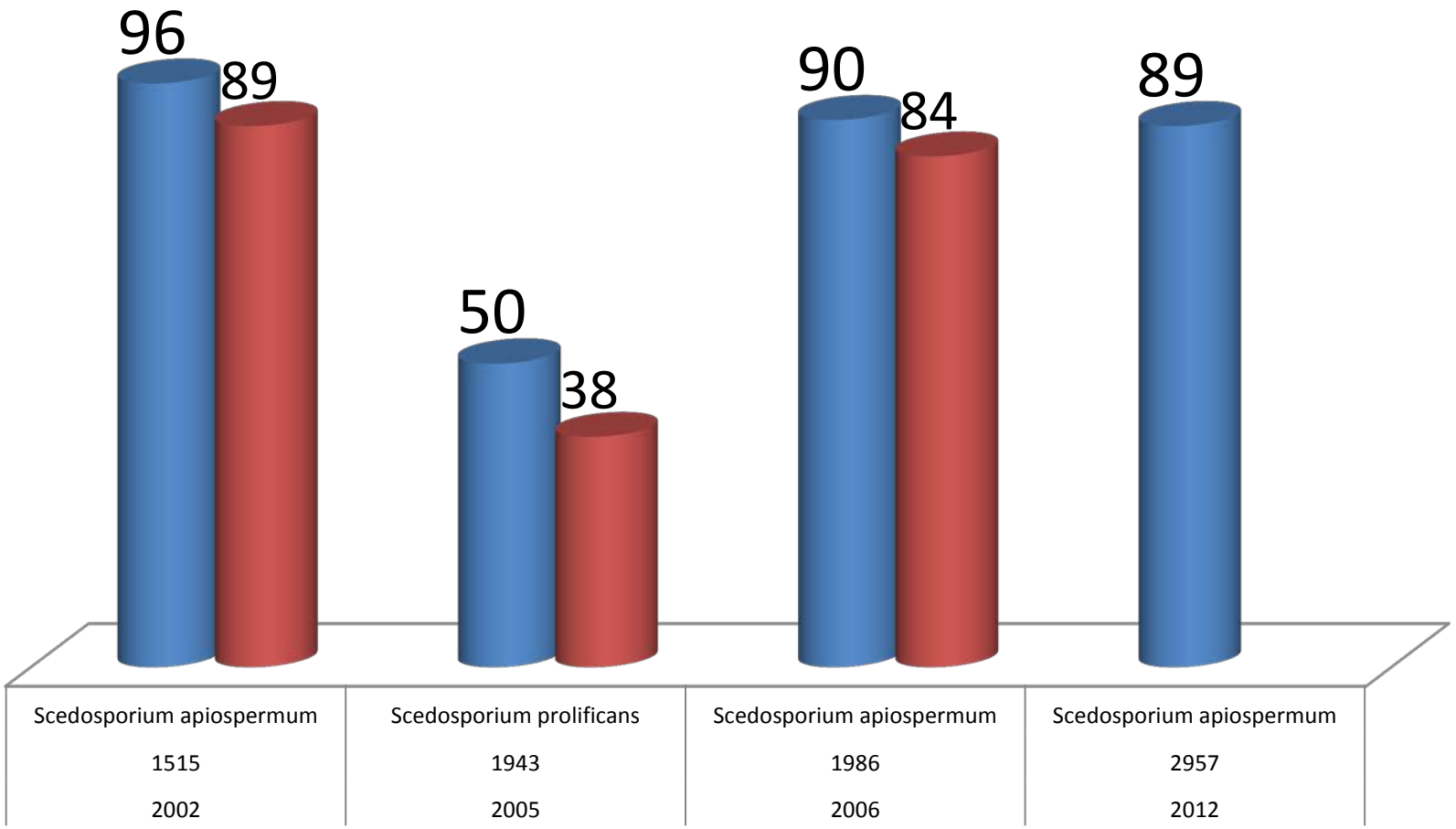
Scedosporium species/ % correct ID



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Mucoraceous moulds

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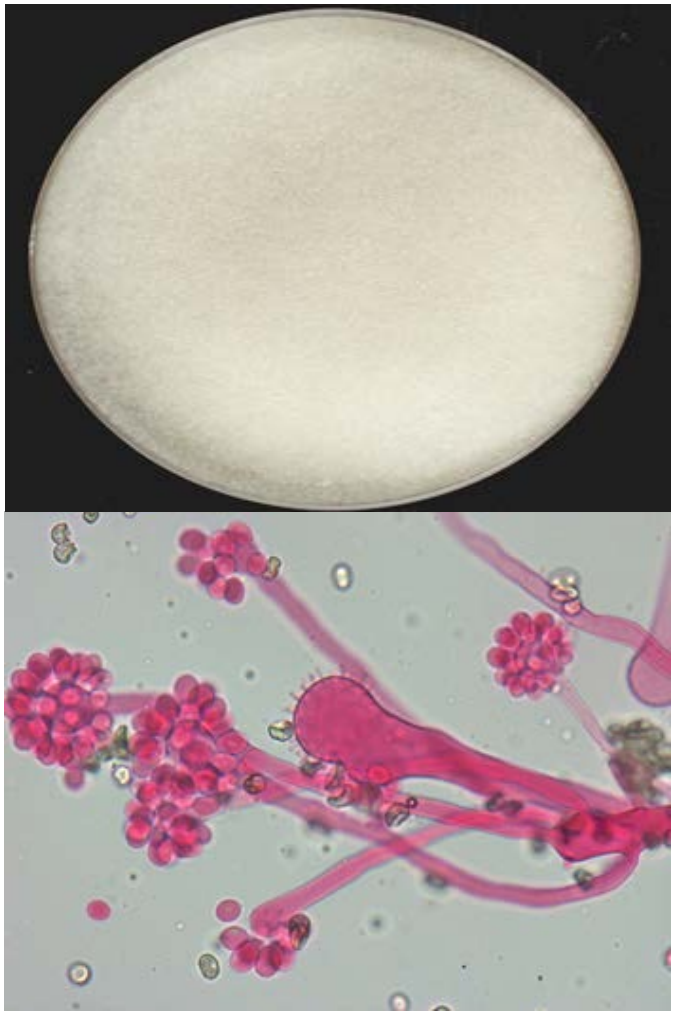
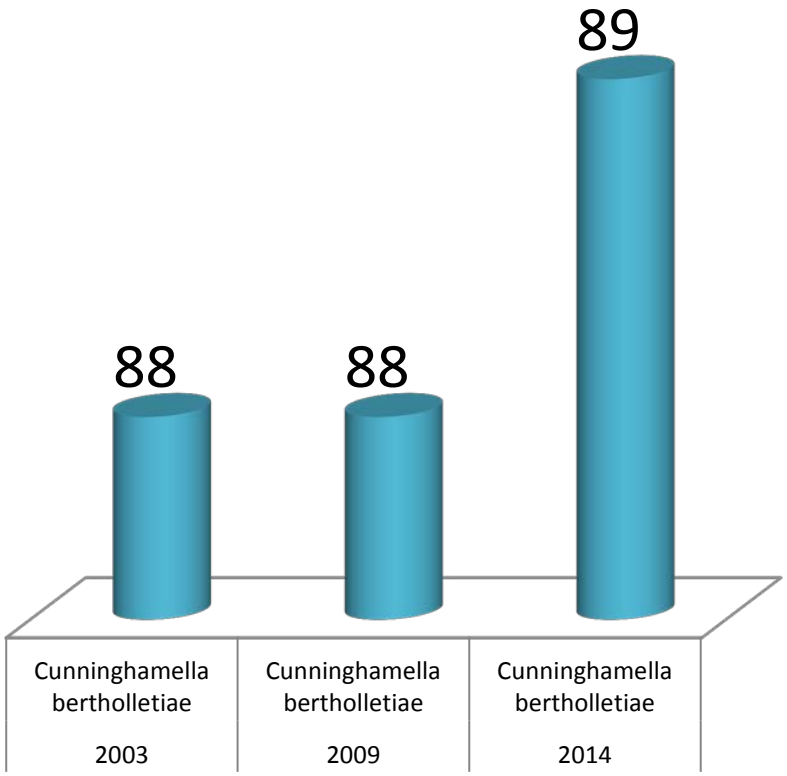
Mucoraceous moulds



***Cunninghamella bertholletiae*/%**
correct ID



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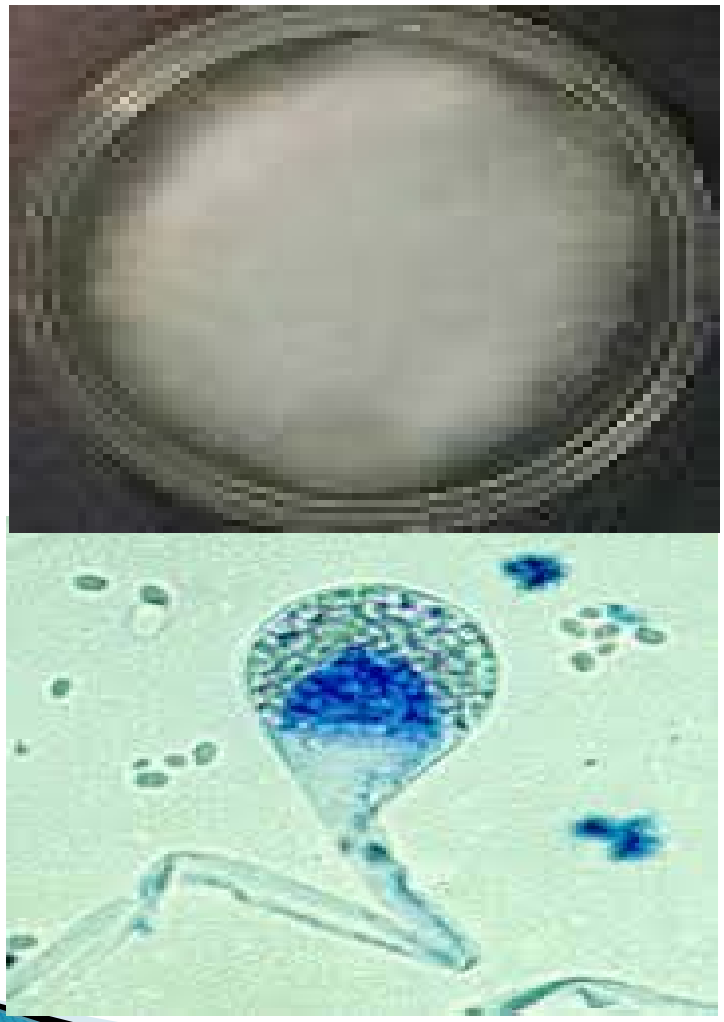
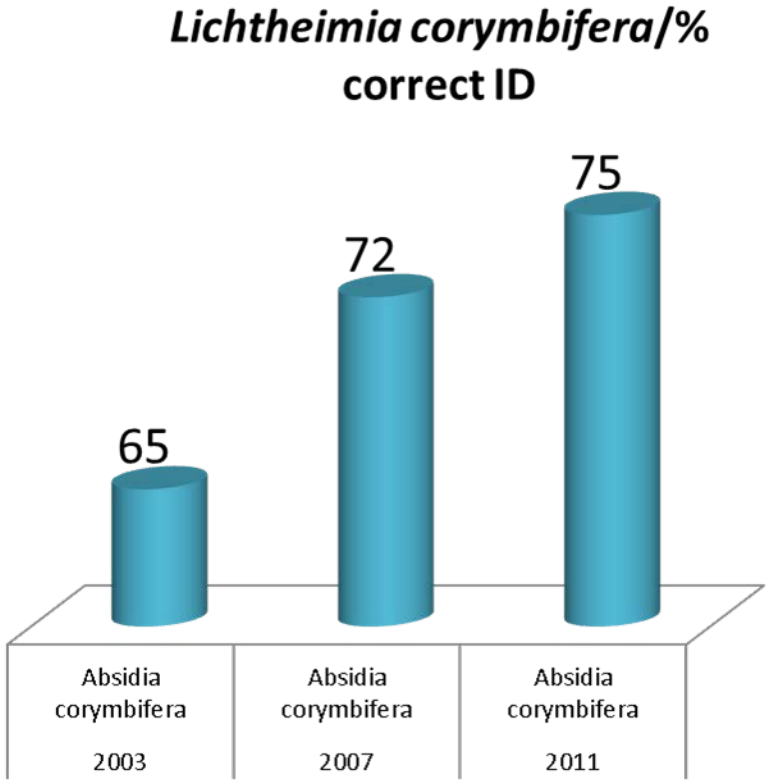
Mucoraceous moulds





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Emerging Pathogens

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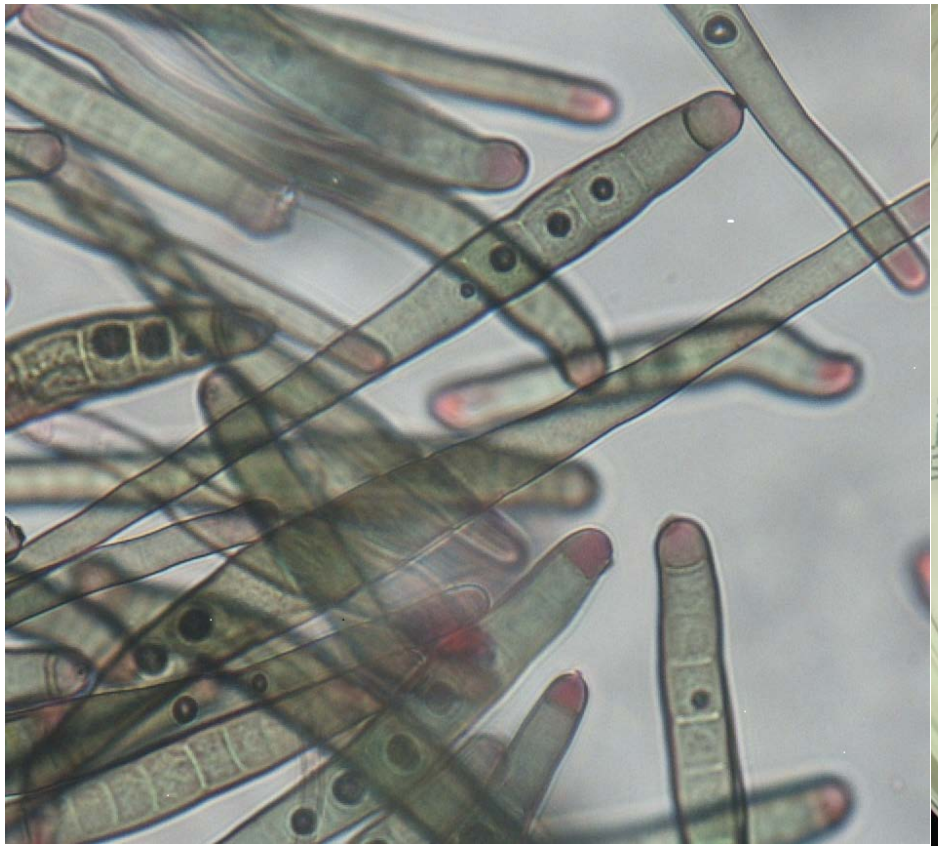
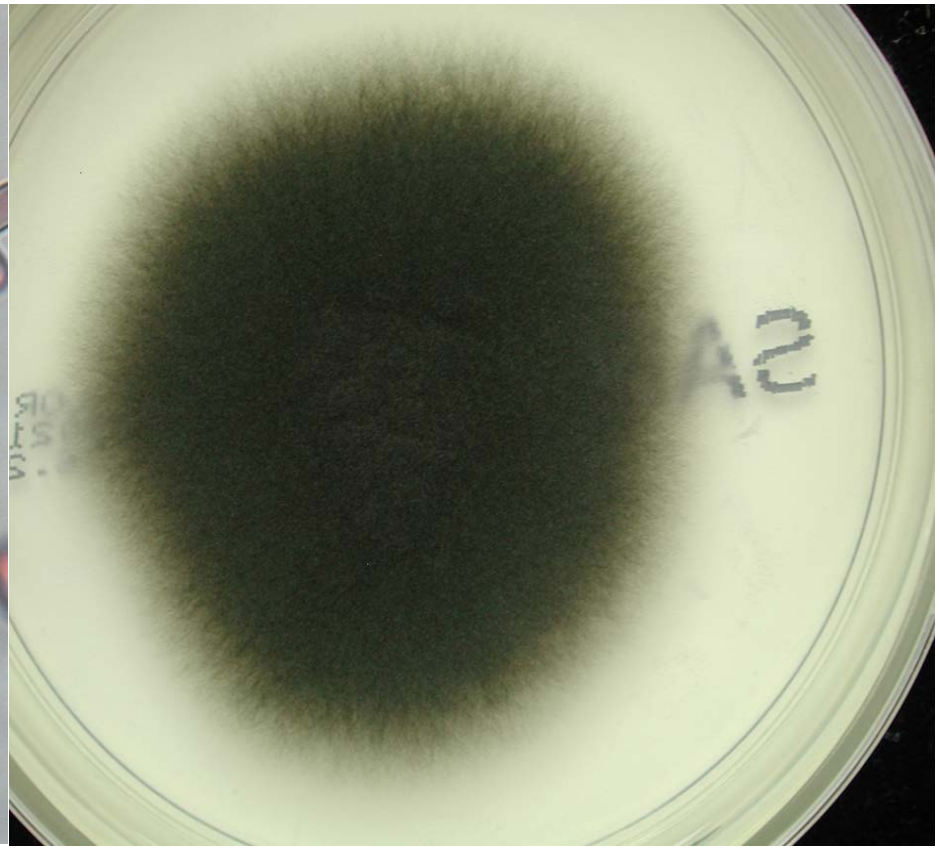
Emerging pathogens:*Exserohilum rostratum*

- Major outbreak of meningitis in the USA which started in September 2012 following the use of contaminated methylprednisolone acetate injections to treat back and joint pain in immunocompetant individuals.
- 751 cases had been reported from a potential 14,000 (October 2013).
- The outbreak encompassed 20 States, causing 384 cases of meningitis with 64 deaths.

Exserohilum rostratum





- 2014: distribution: 3483
- *E. rostratum: correct ID:* UK labs **92.6%**
- All labs 91.7 %

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Report analysis

- With each return of results there were always several transcription errors
- Mis identification of the intended pathogen
  - incorrect species
  - incorrect genus
- Non return of results

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Future data capture on reports

- Request method used to identify fungal pathogen
- Report on the clinical significance of the fungal isolate

Conclusions

- Overall, participants of this scheme have demonstrated a marked improvement in the identification of many fungal pathogens and maintained an expertise in identifying more common isolates.
- Analysis of participants results has highlighted that identification of some fungi remains challenging.

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Conclusions

- It is important to maintain competence in identifying fungi by phenotypic methods to support clinical management of patients, even with new technologies available
- EQA is an important tool in providing evidence of competence and participation in an EQA programme remains an important tool for assessing the performance of clinical diagnostic laboratories

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Acknowledgements

- Dr Liz Johnson and her team at the Mycology Reference Laboratory in Bristol for all their invaluable contributions to and for the scheme.
- The team at UK NEQAS in preparation and distribution of the specimens, results analysis and report production.

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Thank you for listening