

Challenges in prevention and case management of tinea capitis.

An example from a primary school outbreak in 2013.

Amber Litzroth, Scientific Institute of Public Health, detached to Agency for Care and Health Flanders, Epiet MS track fellow cohort 2012.

Ann Packeu, Section of Mycology & Aerobiology, Scientific Institute of Public Health.

Content

- Background and epidemiology
- The outbreak alert
- Outbreak investigation:
 - Aim
 - Methods
 - Results
 - Conclusions
 - Recommendations

Tinea capitis

- Fungal scalp infection
 - Dandruff in patches
 - Bald patches
 - Swelling or sores (kerion)
- Dermatophytes
 - Human-to-human
 - Animal-to-human
 - Soil-to-human
- Oral antifungal treatment
- Prepubertal children



Epidemiology of tinea capitis in Europe



Incidence decreasing since 1950's

- Griseofulvin
- Better surveillance

Mainly animal-to-human

Tourism and migration

- ⇒ shift towards human-to-human in urban regions
- ⇒ increased incidence

Epidemiology of tinea capitis in Belgium

1999 – 2004: *M. audouinii* in 71% of cases*

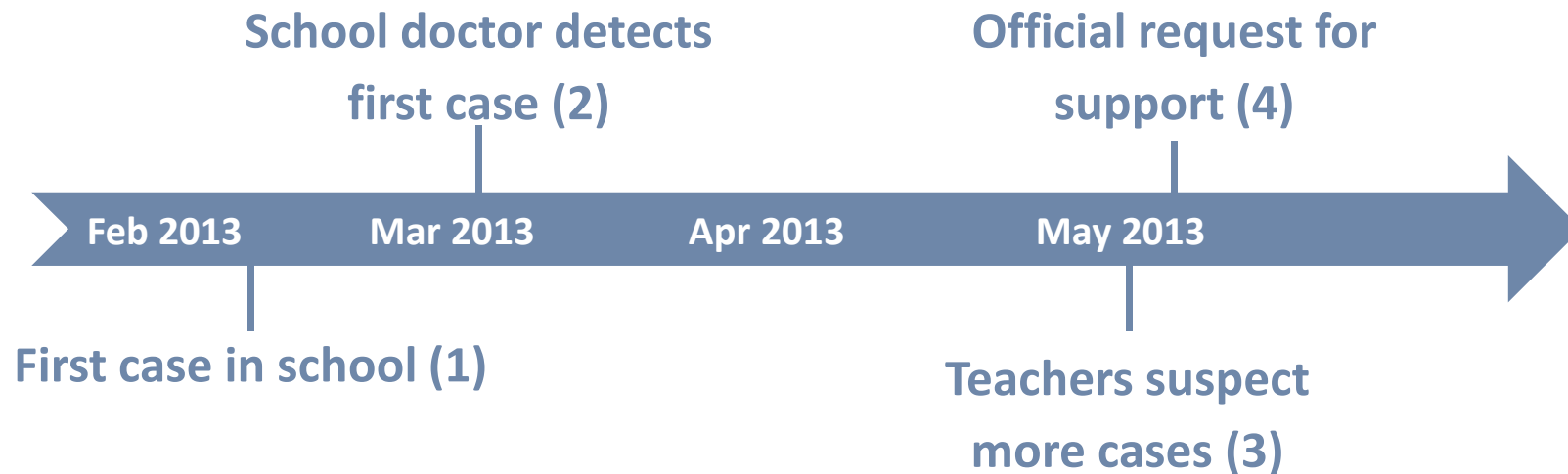
Since 2000 increase in outbreaks

- schools
- day care centres

Not notifiable in Belgium

* As reported by the Unit for Mycoses of Institute of Public Health (IPH)

Primary school outbreak, Antwerp, Belgium, 2013



(1) Case goes undetected

(2) Dermatologist diagnosed *Microsporum canis* infection

= animal-to-human transmitted → no control measures in school

(3) Contact school doctor

(4) School doctor requests support from Agency for Care and Health

The request for support in this outbreak



School doctor contacted Agency for Care and Health, Antwerp:

- Outbreak management
 - Advice
 - Additional epidemiological investigations
 - Additional laboratory investigations

⇒ Start of the outbreak investigation

Aim of the outbreak investigation



- Determine the extent and pathogen
- Evaluate follow up of treatment recommendations
- Describe risk factors

In order to:

- Control the outbreak
- Formulate recommendations for controlling and preventing future outbreaks

Case definition and case finding



Case definition:

Pupil

- Tinea capitis clinically diagnosed by physician after referral by school doctor

Case finding:

24th May 2013

Clinical screening of all pupils during school visit

⇒ referral to physician in case of symptoms

Treatment recommendation for physicians:

- Prescribe oral treatment if tinea capitis

Data collection and descriptive epidemiology



Data collection:

- Demographics, symptoms, treatment prescribed
- School records, physicians, school doctor, teachers
- No questionnaire

Description of cases:

- Age
- Gender
- Symptoms
- Treatment prescribed by the physician

Cohort study



Retrospective cohort study:

- Including all pupils
- Identification of risk factors

Analysis:

- Attack rates
- Adjusted risk ratios (log binomial regression)

Specimen collection



- 3 weeks after school screening
- Symptomatic pupils
- “Tooth brush” method
- Section of Mycology & Aerobiology, Scientific Institute of Public Health



+ Local laboratory data available through physicians

Early control measures



24 May 2013

Note for all parents:

- Clean pillows, combs, ...
- Take symptomatic animals to vet

27 May 2013

Cleaning of school, including stuffed animals, clothes...

Results: Descriptive



Attack rate

19 tinea capitis cases on 291 pupils

→ Attack rate = 6.5%

Description of cases

- 5-13 years, median 8
- 13 (68%) boys
- 14 (73%) prescribed oral treatment
- Symptoms: dandruff in patches to bald patches

Risk factors for tinea capitis infection in a primary school outbreak, Antwerp, 2013.



Risk factor	Adjusted relative risk	P value	95% CI
Contaminated sibling	11	<0,001	5,4-22,5
Contaminated class mate	4,6	0,004	1,6-12,8

No association with age, gender, class, nationality, language spoken at home.

Microbiology results

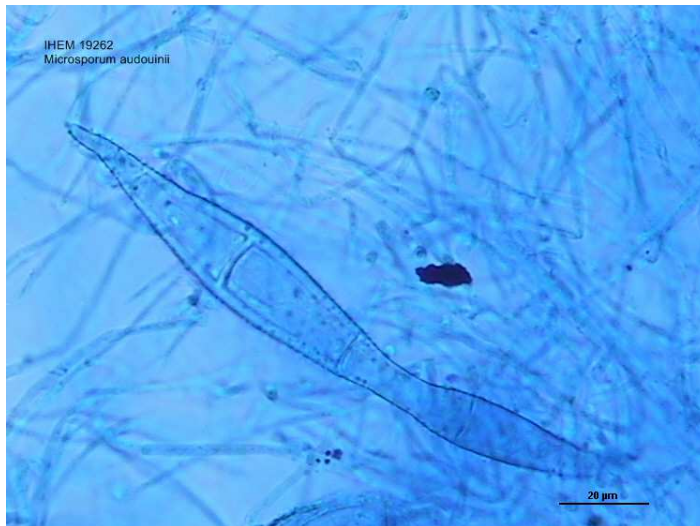


Mycology laboratory	Local laboratory	
Specimens collected in study (N=15)	Physicians (N=3)	Number of results
<i>M. audouinii</i>	Negative	1
<i>M. audouinii</i>	<i>M. canis</i>	2*
<i>M. audouinii</i>	/	3
Negative	/	9

* Including index case

Microsporium audouinii

- Human to human transmitted



- Microscopically resembles *Microsporium canis*
→ laboratory experience needed

Limitations

Specimen collection

- No asymptomatic carriers
- 3 weeks after case finding

Case definition based on clinical diagnosis

Conclusions



1. Quarter of cases did not receive the required **oral antifungal treatment**.
2. **Intrafamilial transmission** had a bigger impact than transmission between class mates.
3. **Misdiagnosis** occurred and contributed to the spread of the outbreak.

Recommendations



1. Development of **guidelines** for physicians on case management of tinea capitis.
2. Placement of additional focus on **prevention of intrafamilial transmission**.
3. Involvement of **specialised mycology laboratories**.

Acknowledgements



Infectious Disease

Control Antwerp

Koen De Schrijver

AGENTSCHAP
ZORG &
GEZONDHEID

Centre for Student
Guidance Het Kompas
Goedele Andries



EPIET

Pawel Stefanoff



AGENTSCHAP ZORG & GEZONDHEID



Mycology & Aerobiology



“Tooth brush” method



max. 21 days (25° C)



Subculture on appropriate media (25° C)

Results after appearances of
morphological characteristics (up to 21
days)

“Tooth brush” method



max. 21 days (25° C)



Subculture on appropriate media (25° C)

Results after appearances of
morphological characteristics (up to 21
days)

Classical identification (ID)



- Correlation of clinical manifestations of infection and observation of macro- and microscopic properties
 - ➔ experienced technologists, morphological characteristics

- DNA sequence-based ID (gold standard)
 - ➔ expensive and time-consuming

**Both restricted by slow growth of dermatophytes
(up to 3 weeks)**

MALDI-TOF MS identification

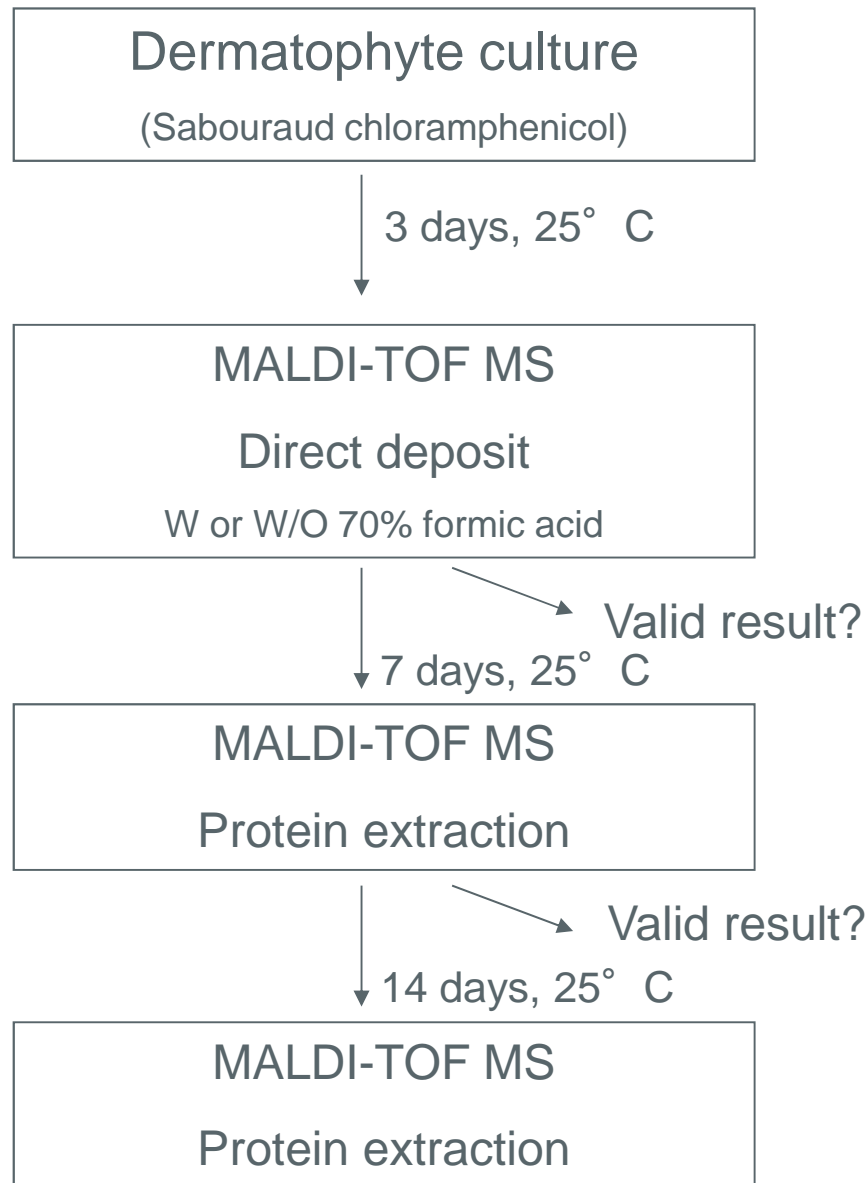
(Matrix Assisted Laser Desorption/Ionisation Time-Of-Flight Mass Spectrometry)



ID dermatophytes:

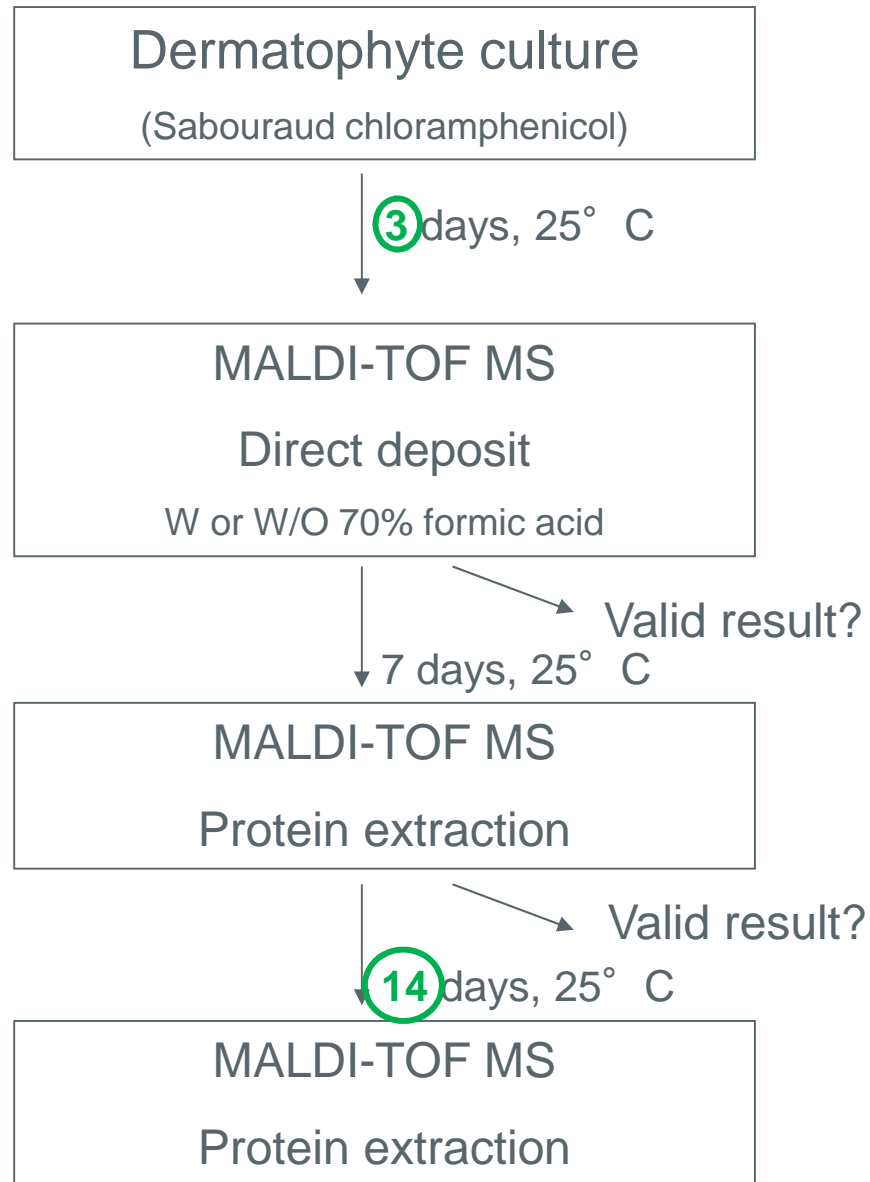
- Improve accuracy
- Decrease analysis time





MALDI-TOF MS Workflow

Use of a robust and extensive databank
195 reference strains, 58 species
BCCM/IHEM fungal collection
CHU Timone, Marseille



MALDI-TOF MS Workflow

Dermatophyte culture
(Sabouraud chloramphenicol)

3 days, 25° C



MALDI-TOF MS
Direct deposit
W or W/O 70% formic acid

7 days, 25° C

Valid result?

MALDI-TOF MS
Protein extraction

14 days, 25° C

Valid result?

MALDI-TOF MS
Protein extraction

Dermatophyte culture

(Sabouraud chloramphenicol)

3 days, 25° C

MALDI-TOF MS

Direct deposit

W or W/O 70% formic acid

7 days, 25° C

MALDI-TOF MS

Protein extraction

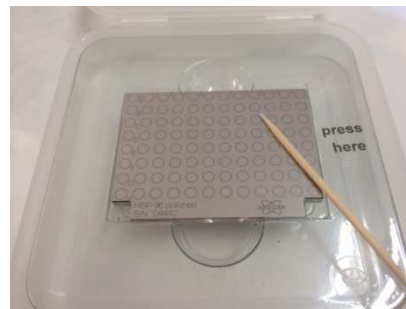
14 days, 25° C

MALDI-TOF MS

Protein extraction

Valid result?

Valid result?



Dermatophyte culture
(Sabouraud chloramphenicol)

↓
3 days, 25° C

MALDI-TOF MS
Direct deposit
W or W/O 70% formic acid

↓
7 days, 25° C

Valid result?

MALDI-TOF MS
Protein extraction

↓
14 days, 25° C

Valid result?

MALDI-TOF MS
Protein extraction

→ **At least 3 out of four spots: same ID (LogScore mean ≥ 1.7)**

Dermatophyte culture

(Sabouraud chloramphenicol)

3 days, 25° C

MALDI-TOF MS

Direct deposit

W or W/O 70% formic acid

7 days, 25° C

MALDI-TOF MS

Protein extraction

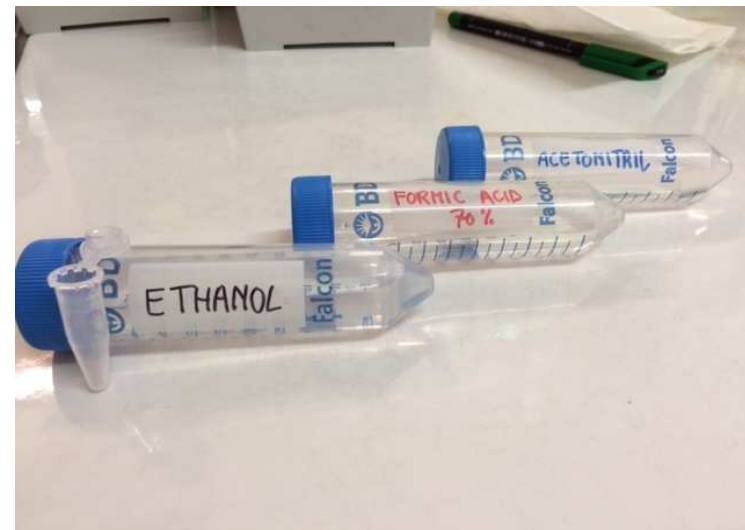
14 days, 25° C

MALDI-TOF MS

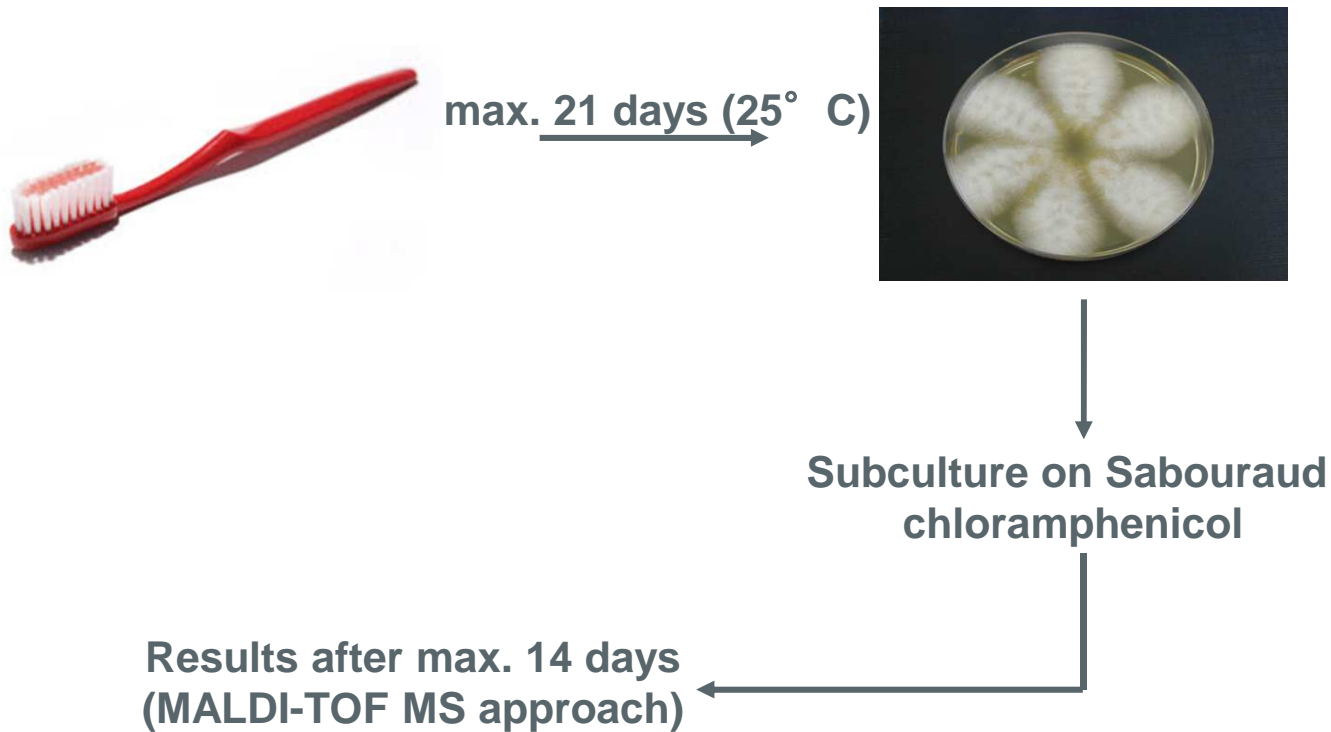
Protein extraction

Valid result?

Valid result?



MALDI-TOF MS approach



present outbreak: results after direct deposit methodology
(3 incubation days of subcultures at 25° C)

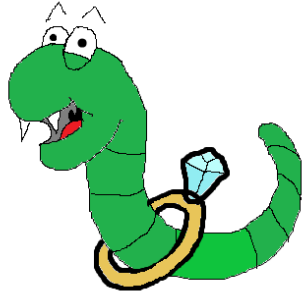
Microsporum audouinii

Conclusion



Tinea capitis:

- Early identification of the causative agent via MALDI-TOF MS approach – (a)symptomatic carriers
- Early identification of the source, initiation of a proper treatment and restriction of the outbreak



Acknowledgements



- Section of Mycology and Aerobiology, WIV-ISP (M. Detandt)
- BCCM™/IHEM Culture Collection (M. Hendrickx)
- H. Beguin and K. Goens from the program Medical Mycology