

Screening of strains of the *Candida parapsilosis* group of the BCCM/IHEM collection by MALDI-TOF MS

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Abstract

One hundred sixty-three strains stored as *Candida parapsilosis* in the BCCM/IHEM collection were reidentified based on internal transcribed spacer sequencing: 92% were identified as true *C. parapsilosis*, while 4.3% and 3% belonged to the closely related species *C. metapsilosis* and *C. orthopsilosis*, respectively, providing important epidemiologic information. Furthermore, we showed that matrix-assisted laser desorption ionisation time-of-flight mass spectrometry is a fast method that can discriminate between these species.

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With the rising number of immunocompromised patients, the incidence of systemic fungal infections has also increased. One of the most common causative agents of mucosal and bloodstream infections is *Candida parapsilosis*. *Candida* species are currently even considered as the fourth leading cause of nosocomial infections in the US (reviewed in Trofa et al., 2008).

C. parapsilosis strains have been divided into three groups (group I, II, and III) based on several characteristics, such as isoenzyme and random amplification polymorphic DNA profiles (Lehmann et al., 1992; Lin et al., 1995; Roy & Meyer, 1998; Rycovska et al., 2004). These groups can also be distinguished based on differences in the ITS1 sequence (Lin et al., 1995). In 2005, it was proposed to replace groups II and III by two new species: *Candida orthopsilosis* and *Candida metapsilosis*, yet the majority of the clinical laboratories do not distinguish between these species, especially since classical physiologic tests and commercial systems such as API (BioMerieux, France) do not discriminate between them (Tavanti et al., 2005; Trofa et al., 2008). *C. parapsilosis* is the most prevalent of the three, while

C. metapsilosis and *C. orthopsilosis* are less frequently isolated (e.g., at prevalence of 6.9% and 5.7% in Spain) (Gomez-Lopez et al., 2008). Despite the genomic differences between the strains, differences in antifungal susceptibility have been reported to be minimal (Gomez-Lopez et al., 2008; Kocsube et al., 2007; Lin et al., 1995; Melo et al., 2007; Tavanti et al., 2007; Tay et al., 2009).

Over the last 30 years, 163 *C. parapsilosis* strains were collected by the BCCM/IHEM collection (Belgian Coordinated Collections of Microorganisms). The vast majority of these strains are of clinical origin (Table 1), and 86% of the strains were isolated in Belgium (data not shown).

We reidentified these strains based on internal transcribed spacer (ITS) sequencing to identify the possible prevalence of *C. metapsilosis* and *C. orthopsilosis* in our collection. DNA isolation and ITS sequencing were performed as described before (Hendrickx et al., submitted for publication; White et al., 1990). Of the strains preserved in our collection as *C. parapsilosis*, we identified 150 strains as *C. parapsilosis* (=92%), 7 as *C. metapsilosis* (=4.3%), and 5 as *C. orthopsilosis* (=3%). One of the strains was identified as *Lodderomyces elongisporus*, a species that can be confused with *C. parapsilosis* (Lockhart et al., 2008). The prevalence of species other than *C. parapsilosis* in our dataset was in the same range as reported before

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Table 1
Overview of the analysed strains

IHEM reference	ID by ITS sequencing	ID by MALDI-TOF MS	Log score		Origin of the strain
			M short	M standard	
6391	<i>C. metapsilosis</i>	<i>C. metapsilosis</i>	1321	NPF	Human tongue
6392	<i>C. metapsilosis</i>	<i>C. metapsilosis</i>	1991		Human bronchoaspiration (cancer)
6393	<i>C. metapsilosis</i>	<i>C. metapsilosis</i>	1346	NPF	Human sputum
6394	<i>C. metapsilosis</i>	<i>C. metapsilosis</i>	NPF	1247	Human sputum
6395	<i>C. metapsilosis</i>	<i>C. metapsilosis</i>	1385	NPF	Human bronchoaspiration (cancer)
16799	<i>C. metapsilosis</i>	<i>C. metapsilosis</i>	1493	NPF	Human skin, foot lesion
23054	<i>C. metapsilosis</i>	<i>C. metapsilosis</i>	NPF	1571	Human groin, eczema marginatum
5576	<i>C. orthopsilosis</i>	<i>C. orthopsilosis</i>	1.76		Human candidemia
15840	<i>C. orthopsilosis</i>	<i>C. orthopsilosis</i>	1638	NPF	Human candidemia
17524	<i>C. orthopsilosis</i>	<i>C. orthopsilosis</i>	1392	1946	Human cutaneous mycosis (skin)
17530	<i>C. orthopsilosis</i>	<i>C. orthopsilosis</i>	1.67	NPF	Soil, Peru
20150	<i>C. orthopsilosis</i>		NPF	NPF	Zoo, elephant nail
1001	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2216		Cosmetics
1019	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1977		Cow milk (mastitis)
1655	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1811		Cow milk (mastitis)
1716	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1958		Dog anus: pododermatitis
1776	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1941		Dust from mattress
2052	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1989		Dwelling environment: floor
2305	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1827		Elephant skin
2938	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1925		Freshwater
3270	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.79		Horseskin: epizootic lymphangitis
4024	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.79		Human anal smear (chronic myeloid leukemia)
4223	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1932		Human candidemia
4224	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2126		Human candidemia
4606	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1896		Human candidemia
4803	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.02		Human candidemia
5555	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1815		Human candidemia
5566	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1941		Human candidemia
6175	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1882		Human candidemia
6273	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.8		Human candidemia
6406	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1932		Human candidemia
6464	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1992		Human candidemia
6477	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2184		Human candidemia
6478	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1996		Human candidemia
6770	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1809		Human candidemia
6771	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1969		Human candidemia
7341	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1843		Human candidemia
7464	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1696	1.85	Human candidemia
9557	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1988		Human candidemia
14404	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1807		Human candidemia
14659	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.83		Human candidemia
14785	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1872		Human candidemia
15244	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2054		Human candidemia
15262	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1935		Human candidemia
15453	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1897		Human candidemia
15482	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1944		Human candidemia
15567	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2127		Human candidemia
15586	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2051		Human candidemia
15647	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1861		Human candidemia
15982	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1869		Human candidemia
16003	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1747		Human candidemia
16274	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1752		Human candidemia
16302	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1801		Human candidemia
16791	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1931		Human candidemia
16851	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2009		Human candidemia
16885	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1994		Human candidemia
16903	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	NPF	1944	Human candidemia
17509	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1965		Human candidemia
17510	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1896		Human candidemia
17511	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	NPF	1883	Human candidemia

(continued on next page)

Table 1 (continued)

IHEM reference	ID by ITS sequencing	ID by MALDI-TOF MS	Log score		Origin of the strain
			M short	M standard	
17512	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1921		Human candidemia
17513	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.763		Human candidemia
17514	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.743		Human candidemia
17521	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.974		Human candidemia
17522	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.981		Human candidemia
17523	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	1.814	Human candidemia
17532	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.955		Human candidemia
17692	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.805		Human candidemia (acute myeloblastic leukemia)
17735	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.123		Human candidemia (antibiotherapy)
17737	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.795		Human candidemia (antibiotherapy)
17744	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	2.116	Human candidemia (antibiotherapy)
17952	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.111		Human candidemia (antibiotherapy)
17991	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.739		Human candidemia (antibiotherapy)
17994	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.923		Human candidemia (antibiotherapy)
18442	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.833		Human candidemia (antibiotherapy, catheter, parenteral)
19002	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.108		Human candidemia (antibiotherapy, catheter)
19074	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.837		Human candidemia (antibiotherapy, catheter)
19086	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.887		Human candidemia (antibiotherapy, catheter)
19115	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.914		Human candidemia (antibiotherapy, catheter, surgery)
19167	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.003		Human candidemia (antibiotherapy, cirrhosis)
19190	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.921		Human candidemia (antibiotherapy, solid tumor)
19216	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.799		Human candidemia (autopsy)
19231	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.858		Human candidemia (bladder catheter)
19232	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.151		Human candidemia (bladder cancer)
19240	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.772		Human candidemia (catheter)
19242	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.914		Human candidemia (catheter)
19249	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.883		Human candidemia (catheter)
19274	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.859		Human candidemia (catheter)
19277	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.017		Human candidemia (catheter, antibiotherapy)
19288	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.952		Human candidemia (catheter, antibiotherapy)
19374	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.878		Human candidemia (catheter, antibiotherapy, cellulitis)
19417	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.014		Human candidemia (catheter, antibiotherapy, stomach)
19421	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	1.975	Human candidemia (catheter, bladder cancer)
19475	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.928		Human candidemia (catheter, bladder cancer)
19477	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.831		Human candidemia (catheter, chronic hemodialysis)
19489	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.813		Human candidemia (catheter, corticotherapy)
19498	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.85		Human candidemia (catheter, diabetes, dialysis)
19503	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.955		Human candidemia (catheter, renal tumor)
19512	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.789		Human candidemia (chronic necrotic ulcer)
19659	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.79		Human candidemia (colon cancer)
19758	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.783		Human candidemia (corticotherapy)
19765	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.852		Human candidemia (Corticotherapy, antibiotherapy)
19868	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.916		Human candidemia (Corticotherapy, pneumonia)
19869	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.886		Human candidemia (dermatomycosis)
19909	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	1.873	Human candidemia (diabetes)
19979	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>168</i>	2.006	Human candidemia (drug addict)
19996	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.733		Human candidemia (drug addict)
20003	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.802		Human candidemia (drug addict)
20078	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.801		Human candidemia (endocarditis on prosthetic valve)
20095	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.876		Human candidemia (hematologic patient)
20111	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.943		Human candidemia (kidney stones)
20112	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.729		Human candidemia (necrotic pancreatitis)
20135	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.978		Human candidemia (parenteral nutrition)
20309	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.967		Human candidemia (parenteral nutrition)
20310	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.139		Human candidemia (solid tumor)
20358	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.079		Human candidemia (solid tumor)
20359	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.214		Human candidemia (spondylodiscitis)
20361	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.17		Human candidemia (surgery)
20630	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	1.974	Human candidemia (surgery)
20653	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.881		Human candidemia (surgery, catheter)
20665	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.896		Human candidemia (tracheoesophageal fistula)
20719	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.941		Human candidemia (tuberculosis)

Table 1 (continued)

IHEM reference	ID by ITS sequencing	ID by MALDI-TOF MS	Log score		Origin of the strain
			M short	M standard	
20724	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	1.977	Human candidemia (tumor rectum)
20741	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.922		Human candidemia (urine)
20778	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.052		Human cerebrospinal fluid (child)
20779	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.888		Human dental prosthesis
20790	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	2.015	Human ear
20791	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.851		Human faeces (acute myeloblastic leukemia)
20898	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.955		Human foot (interdigital) lesion
20899	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.905		Human foot lesion (diabetes)
21722	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	1.803	Human keratitis
21723	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.075		Human mouth (healthy)
22061	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.896		Human mycotic otitis externa
22255	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	2.127	Human onychomycosis
22259	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.025		Human onychomycosis
22260	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.792		Human onychomycosis
22270	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.877		Human onychomycosis
22599	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.89		Human onychomycosis
22603	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.768		Human onychomycosis
22608	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.204		Human onychomycosis
22611	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>1.668</i>	1.807	Human onychomycosis
22635	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.832		Human osteo-articular infection (biopsy)
22652	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.977		Human pulmonary tuberculosis (sputum)
22661	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.936		Human pulmonary tuberculosis (sputum)
22698	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.835		Human pulmonary tuberculosis (sputum)
22883	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.901		Human pulmonary tuberculosis (sputum)
22884	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.184		Human skin
22885	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.213		Human skin
22887	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.16		Human skin
22890	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.616		Human skin
23052	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.906		Human skin (mammary)
23053	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	<i>NPF</i>	2.198	Human sprue
23057	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.937		Human foot lesion
23058	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.746		Human urine
23059	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.158		Human vaginitis
23115	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.13		Human wound
23117	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.874		Human wound (burned patient)
23118	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.891		Human wound (burned patient)
23119	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.894		Intensive pediatry
23120	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.887		Oncology pediatrics
23121	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	1.917		Sand from a sandpit
23162	<i>C. parapsilosis</i>	<i>C. parapsilosis</i>	2.026		Unknown
4804	<i>L. elongisporus</i>	<i>L. elongisporus</i>	1.945		Sand from a sandpit

This table represents an overview of the strains identified by ITS sequencing and MALDI-TOF MS and their origin. For the MALDI-TOF MS, log scores for both methods used (M short and M standard) are given (log scores under 1.7 are marked in italic); if no peaks were found, NPF is indicated.

(Gomez-Lopez et al., 2008; Silva et al., 2009; Tavanti et al., 2007). Interestingly, while almost 75% of the *C. parapsilosis* strains came from a candidemia, none of the *C. metapsilosis* strains did. Six (=85%) of the 7 *C. metapsilosis* strains came from mucosal infections, while only 9 (=6%) of the 150 strains of *C. parapsilosis* had a mucosal origin. The fact that most of the *C. parapsilosis* strains are isolated from bloodstream infections while *C. metapsilosis* is more often isolated from local infections might indicate a difference in pathogenicity between these species. Little epidemiologic data on these species are available, but *C. metapsilosis* has indeed been reported as the least virulent of the three (Gacser et al., 2007; Orsi et al., 2010). To investigate the epidemiology of these species, correct identification up to the species level is critical. Since DNA sequencing is quite

time consuming, we investigated whether the much faster matrix-assisted laser desorption ionisation time-of-flight mass spectrometry (MALDI-TOF MS) method could also be used for this purpose. Strains were cultivated on Sabouraud medium for 72 h before analysis with the Microflex MALDI Biotyper 2.0 (Bruker, Germany). Instead of using the standard method recommended by the manufacturer (M standard), we analyzed the strains using the much shorter method (M short) that was recently described by Goffinet et al. (submitted for publication) (5 min instead of 60 min). M short did not involve pretreatment of the samples, but consists of direct deposition of the strain on the MALDI target and treatment of the sample with 70% formic acid (Goffinet et al., submitted for publication).

Of the 163 strains, 148 could readily be identified by M short (=90.7%); for the 15 others, no peaks could be found (Table 1). However, we decided to reanalyse all strains with a log score under 1.7 (10 in total) together with the 15 unidentified strains with M standard. Sixteen of the 25 strains could be identified with a log score above 1.7 (Table 1), meaning that, in total, 99.3% of the strains could be identified by MALDI-TOF MS. Interestingly, all of the *C. parapsilosis* strains could be identified and 90% of them by M short with a log score above 1.7. Of the *C. orthopsilosis* and *C. metapsilosis*, 10 of the 12 strains needed to be reidentified by M standard. However, even if strains were identified with log scores under 1.7 and even if the identification was marked by the software as ‘unreliable’, no false identifications were given. The reason for the more problematic identification of *C. metapsilosis* and *C. orthopsilosis* is probably that more reference profiles are available in the database provided by the manufacturer for *C. parapsilosis*, making the chance of unambiguous identification higher. The *L. elongisporus* strain was directly identified by M short with a sufficiently high log score.

This study provides the first epidemiologic information about *C. parapsilosis* and its related species *C. metapsilosis* and *C. orthopsilosis* in Belgium, and their prevalence is in agreement with what has been found elsewhere (Gomez-Lopez et al., 2008; Silva et al., 2009; Tavanti et al., 2007). ITS sequencing was proven to be sufficient for their correct identification, but since it is quite time consuming and not always appropriate in clinical laboratories for urgent cases, we tested whether MALDI-TOF MS could provide a useful alternative. 99.3% of the strains could indeed be identified by this method. Furthermore, in our dataset, a difference in the origin can be observed between the species. However, to obtain conclusive results concerning this topic, a larger dataset is needed. Once more, this underlines the importance of correct identification up to the species level in clinical laboratories in order to obtain epidemiologic data.

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