

Candida species in stool, symptoms and complaints in general practice – a cross-sectional study of 308 outpatients

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Summary

Patients with unspecific symptoms were sometimes tested for *Candida*. In case of findings of this yeast-like fungus in their stools they often were labelled with the diagnosis of a 'Candida-syndrome'. This comprises headache, weakness, flatulence, ravenous appetite for sweets, itching skin and several more unspecific symptoms. All 500 randomly sampled patients in 12 mainly naturopathic practices were asked to take part. In case of participation, they received stool-tubes and questionnaires to be answered during the waiting-time by the patients themselves. We asked for details of lifestyle, diseases and a number of unspecific symptoms. The stool-tubes were sent to a microbiological lab within 24 h after being filled. About one-third of all 308 participants carried *Candida albicans* in their stools. This finding is regarded as normal. Smoking habits were highly associated to *Candida*: 45 of the 78 smokers (58%), but only 68 of the 230 (29%) non-smokers were *Candida* positive, $P < 0.0001$. Three more results were associated with *Candida*-positive stools: *Candida*-vaginitis, allergies against food and allergies in general. Hints of a *Candida*-syndrome could not be found. The relation with smoking cigarettes is a new result. Associations to *Candida*-vaginitis and allergies were described before.

Key words: *Candida* hypersensitivity-syndrome, intestinal mycosis, cigarette-smoking, oral fungus, *Candida* vaginitis

Introduction

One of the arts of doctoring in primary care is the diagnostic work in patients with common, but unclear symptoms, as for instance loss of energy, chronic or sudden headache, skin irritations, increased flatulence, intolerance of or even craving for certain kinds of food. First in the USA, and from the 1990s on also in Germany, it was postulated that *Candida* species may produce many unspecific symptoms, even more as mentioned above, labelled as a 'Candida-(hypersensitivity-)syndrome'.^{1–3}

A lot of scientific understanding already exists about this yeast-like fungus.^{4–8} The 'Candida-(hypersensitivity-)syndrome' therefore can be well distinguished from the clinically relevant *Candida*-infections: stomatomycosis, intertrigo, perlèche, glossitis, oesophagitis, diarrhoea and *Candida* sepsis, indicating immunosuppression.

For some years, there was quite a noise in the lay press and a high attention from the patients' side.^{9,10} The 'Candida-(hypersensitivity-)syndrome' first was not clearly refuted in the scientific literature.^{11–13} Treatment with nystatin or diet seemed to improve several symptoms^{2,14,15} and many of our patients inquired for the topic. On behalf of that situation, we decided to explore the association between complaints and the occurrence of *Candida* in our patients. To research the topic, we posed the question: are patients with *Candida* in their stool statistically more likely to suffer from

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complaints, symptoms or diseases than patients without?

Patients and methods

In 12 general practices in the Bonn area, nine of them with a focus on naturopathy, we consecutively addressed *all* patients born on an odd day and in an odd year, so that at the end every fourth person dropping in was randomly asked to participate. The patients were recruited over a 2-weeks period of February.

Those willing to participate received a written explanation, a questionnaire and a stool test tube together with a written instruction: the samples must be taken from several points of the stools. The tubes had to be kept in the refrigerator unfrozen and brought to the practice on the next day, at the latest. The questionnaires were completed by patients during the waiting-time without assistance. The questionnaire (see Appendix) consisted of questions concerning eating habits (12 questions) and smoking (1 question), and 15 open or structured questions focussed on chronic and acute symptoms and complaints. Six questions asked for present medical treatments and another six for demographic data. The test tube usually was filled at home. After being handed in, stool samples were sent by courier to microbiological lab daily.

When arrived, stool samples were instantly spread out on a Sabouraud agar, incubated at 37 °C overnight and thereafter on a differentiation media to test for several *Candida* species. A smear for microscopy was also performed. Microbiological tests were performed by the quality-controlled lab of Dr J. Gaal, consultant, Bonn.

Test-kits and nutrient media:

1 Sabouraud-agar with traces of chloramphenicol and gentamycine (Oxoid GmbH, Wesel, Germany).

2 Bichro-Latex *albicans* agglutination assay (Biotrin Int., Dublin, Ireland).

3 ID 32 C, suspension measuring stripes (Bio-Mérieux, Hazelwood, MT, USA).

The questionnaire's layout and parts of the analysis were made by the demoscopic research institute SALSS, Bonn and the Institute for Medical Statistics, Documentation and Data Processing of the University of Bonn. The statistics used are the two-sided *Pearson-test*, calculated with the help of SPSS Vs. 10. Multiple significance level was calculated as p/k according to *Bonferroni*, meaning (p) = local significance level, (k) = number of tests.¹⁶

Results

A total of 325 of the 500 questionnaires handed out were returned and could be included, because all main answers were given. A total of 308 corresponding stool-samples were tested. As typical for general practices, female patients clearly outnumber the males (219/67.41% or 99/32.61%). Ages of participants and frequency of *Candida* occurrence are shown in Table 1. The range varies from a around 25% to 50% positive findings. In the age groups from 28 to 57 years, which comprise the most participants, we found about a third of patients with yeast in their stools. Less *Candida* was found among school-aged children and very old people, most in young adults and adults from 58–67 years.

Table 2 shows the answers to the question 'From which complaints are you suffering most?' Among the 18 most frequent answers, we found six symptoms/

Table 1 Age and distribution of *Candida* findings

Age in years	5–17 (%)	18–27 (%)	28–37 (%)	38–47 (%)	48–57 (%)	58–67 (%)	68–78 (%)	78–85 (%)	Missing data (%)
<i>Candida</i> -positive [<i>n</i> = 112 (34.5%)]	4 (1.2)	14 (4.3)	26 (8.0)	27 (8.3)	16 (4.9)	19 (5.8)	6 (1.8)	0	0
Proportion of <i>Candida</i> -positives in the age-section	22.2	42.4	34.2	34.1	30.2	50	33	0	–
<i>Candida</i> -negative [<i>n</i> = 196 (65.5%)]	14 (4.3)	17 (5.2)	45 (13.8)	45 (13.8)	35 (10.8)	19 (5.8)	12 (3.7)	6 (1.8)	3 (1.0)
Proportion of <i>Candida</i> -negatives in the age-section	77.8	51.5	59.2	56.9	66.0	50	66.7	85.7	–
No stool sample (<i>n</i> = 17)	0	2	5	7	2	0	0	1	0
Total [<i>n</i> = 325 (100%)]	18 (5.5)	33 (10.2)	76 (23.4)	79 (24.3)	53 (16.3)	38 (11.6)	18 (5.5)	7 (2.2)	3 (0.9)

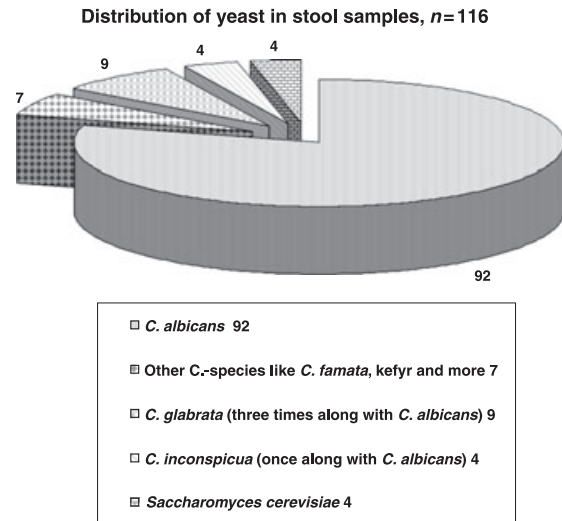
Table 2 From which complaints are you suffering most? Tell us up to three complaints and give the rank ($n = 308$)

1	Headache, migraine	71
2	Backache	55
3	Abdominal complaints	32
4	Rheumatism, arthrosis, joint complaints	31
5	Asthma, cough, bronchitis, difficulty in breathing	24
6	Eczema, itching	22
7	Infection of the respiratory tract	22
8	Tiredness, decreasing strength	21
9	Dizziness, vegetative complaints	18
10	Cervical spine complaints	17
11	Sinusitis	12
12	Aching muscles	11
13	Depression, anxiety	10
14	Allergy, pollinosis	10
15	Heart complaints	10
16	Hypotension	8
17	Skin diseases	8

conditions claimed to be associated with the *Candida*-syndrome: headache/migraine, abdominal complaints, eczema/itching, tiredness/low performances levels, allergy/pollinosis, skin diseases other than eczema.

From a total of 308, in 92 stool samples *Candida albicans*, in further 16 several other *Candida* species, e.g. *Candida glabrata* were detected (see Fig. 1). In four cases, two different *Candida* species could be identified. *Saccharomyces cerevisiae* (brewers' yeast) was detected in further four samples, thus resulting in 112 *Candida*-positive and an overall of 116 positive yeast findings (see Fig. 1).

Only a few items of our questionnaire showed a statistical association to the finding of *Candida* in stool (Table 3). Forty-five of the 78 smokers (58%), but only 68 of the 230 (29%) non-smokers were *Candida*-positive. Suffering from recurrent vaginal mycosis, *Candida* in stool was found in 16 of 30 (53%) women, but in only 58 of the 171 (34%) women without vaginal mycosis. Allergies in the questionnaire and

**Figure 1** Findings of yeast in stool.

positive *Candida* test were positively associated too (see Table 3).

No further statistical associations could be demonstrated between *Candida albicans* in stool and the various items of the questionnaire – especially not to headache/migraine, abdominal complaints, eczema/itching, tiredness/low general performances level, pollinosis, skin diseases other than eczema (see Table 2).

Proponents of the so-called 'yeast-connection' emphasise that consuming sweets are a major risk factor for the *Candida*-syndrome. This was not supported by our findings: distribution of positive and negative *Candida* tests were the same in patients who frequently were consuming sweets and patients who did not.

Sometimes it is argued that the clinical relevance of *Candida* depends on the degree of colonisation. Our data do not allow to test this statistically. Most of our findings showed 'rare' and 'some' colonisation (see Table 4).

Table 3 Associations of *Candida* findings in stool and the patient's statements

	<i>n</i>	Answer	Positive findings of <i>Candida</i> in stool	Negative findings of <i>Candida</i> in stool	Pearson-test, two-sided
Smoker?	308	Yes (78)	45	33	$P = 0.000083$
		No (230)	68	162	
Vaginal-mycosis?	201	Regular or permanent (30)	16	14	$P = 0.040$
		rare, never (171)	58	113	
Allergies in general?	299	Yes (153)	67	86	$P = 0.015$
		No (146)	44	102	
Food-allergie?	295	Yes (61)	29	32	$P = 0.034$
		No (234)	77	157	

Table 4 Density of *Candida* in stool samples

Density of colonisation	Rare	Some	Frequent	Dense	<i>Saccharomyces cerevisiae</i>
<i>n</i> = 116					
Number	30	56	25	1	4

Discussion

The present study confirms data of other studies on the prevalence of *Candida albicans* in stool.^{10,12} It indicates that *Candida* in stool is associated with smoking, *Candida*-vaginitis and allergies. At first these results are a statistical, not a causal finding.

The statistical associations to *Candida*-vaginitis or allergies seem to sustain the supposed pathological influence of intestinal *Candida* in these cases. If we however adjust the results to multiple testing, the necessary *P*-value will decrease from 5% down to 0.31% ($0.05/16 = 0.0031$) along with Bonferroni. That does not negate associations to *Candida*-vaginitis or allergies but lowers the probability of an statistical type one error (and increases a type two error as well). *Candida*-vaginitis and allergies connected to *Candida* occurrence in stool have been discussed (and published) extensively elsewhere.

The statistical association of cigarette-smoking and a positive *Candida* test still remains significantly even after adjustment. As the oral cavity is a known reservoir for *Candida*, this result suggests that smoking produces a milieu allowing *Candida* to grow, thereby influencing the colonisation of the stool.^{18,19} A study with French students showed that *Candida albicans* in the oral cavity is more often found in male subjects, smokers, those with heavy plaque formations, pH < 7 and unbrushed teeth for 8 h or more.²⁰ Similar results were found in a study of healthy South African adults with a higher incidence of oral *Candida* yeast only in male smokers.²¹

The prevalence of yeast colonisation in the mouth cavity increases with age, independently of whether dentures are used.²² A Jordanian research team recorded *Candida* in the mouth of 78.3% of 230 denture-wearers, with colonisation most frequent and dense in smokers.²³ 77% of 414 insulin-dependent diabetics showed oral *Candida* colonisation, though 40% of them did not display any clinical symptoms. Here, too, smokers were tested positive for *Candida* more often than others.²⁴

The time- and temperature-dependent changes of the mycotic colonisation of the stool because of the transport are considered as a serious restriction on the validity of microbiological findings. A study shows that

this problem is overemphasised.¹⁷ Additionally by conducting the study during a cold season and by ensuring, that the stool samples were sent to the laboratory within 24 h, the yeast are unlikely to have been overgrown or died. The one and single stool sample is a shortcoming related to the cross-sectional character of the study. The limited financial support did not allow controls or oral swabs too. On the contrary, we took greater methodical care during the study than circumstances in general practice normally allow, when an intestinal *Candida*-related problem is diagnosed.

Our results did not show headache/migraine, abdominal complaints, eczema/itching, tiredness/low general performances level, pollinosis, other skin diseases or the influence of intake of sweets to be associated to *Candida* occurrence in stools, each one considered as a part of the *Candida*-hypersensitivity-syndrome. Seen together with recent reviews,^{25,26} our exploratory study leads far away from that idea. *Candida* in stool without evidence of a *Candida*-infection such as *Candida*-vaginitis is a normal finding. There is no need for further diagnostics towards a *Candida*-related disease or a therapeutic intervention than. Avoiding sweets because of *Candida* in stool does not appear to be useful. *Candida*-yeast often grow in the oral cavity and are promoted by several factors, one of which we assume to be cigarette-smoking. Whether this influences the growth of *Candida* in the bowels could only be shown by further research.

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Conflicts of interest

None.

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Appendix: The Applied Questionnaire

Are you a quick eater; how often do you consume sweets; how often do you use wheat/oats and other-bulk substances in your meals; how often do you eat muesli or coarse wholemeal bread; do you eat mold cheese? How often do you use yeast flakes in addition to your food; how many glasses of beer (0.3 l) or wine (0.1 l) do you drink a week; did you drink any fruit juices during the past three days; do you use any artificial sweeteners; are you aware what kinds of substances they are? Do you tolerate fresh milk? Which kinds of food do you not tolerate; are you allergic to food; if yes, which kinds of food? Do you smoke cigarettes, pipe, cigars, cigarillos? How much do you smoke?

What is the frequency of your bowel movement? Is your stool slimy, bloody, irritating soft or hard? How often do you suffer from flatulence; how often do you use laxatives; which ones? How often do you suffer from complaints concerning your stomach; which kinds of complaints do you have; what is the best cure in those cases? Which kinds of other complaints do you suffer from; how fit did you feel during the past weeks; do you suffer from the following skin irritations: nettle rash,

anal itching, chronic barber's itch, frequent inflammation of the angles of your mouth, chronic inflammation of the nail wall, psoriasis, fungal nail or skin infection? Do you suffer from the following complaints : chronic furry tongue along with chronic sore throat; red aching tongue, treated caries (number of filled teeth), gingivitis with white plaque; do you suffer from allergies; do you suffer from vaginal fungus? Which chronically recurrent diseases have been diagnosed and which ones are still present? Which kind of complaint made you see a doctor? Do you assume that there is a physical or a psychological reason for your current complaint?

Do you take any kind of chronic medication? Do you take a birth control pill? In case an intestinal fungus is diagnosed: do you see any connection to your current complaints? Would you agree to a treatment with, for instance, a harmless anti-fungal medication; would you stick to a sugar-free diet; would you agree to a low risk medical treatment of the fungus?

I am ... years of age; I am male/female; the following persons in my surroundings suffer from similar complaints; my profession is...; I work ... hours a week; I am doing the following sports on a regular basis...