

Low positivity rate and high percentage of nondermatophyte molds in an analysis of 35,257 fungal nail culture results from a United States national commercial laboratory, 2019-2022



To the Editor: Onychomycosis is an under-recognized public health topic. Recent US data on laboratory testing and causative organisms are lacking, with the last large analysis performed in 2000.¹ Understanding culture testing patterns and species isolated can help characterize disease burden and inform diagnosis and treatment practices.

We analyzed results of nail fungal cultures ordered during March 1, 2019-March 1, 2022 performed at Labcorp, a major national commercial laboratory, by patient demographics characteristics, region, species, ordering provider type, result timing, and month.

Among 35,257 nail culture results (2098 fingernail, 16,798 toenail, 16,631 unspecified), 18,027 (51.1%) were negative for fungus (1196 fingernail, 8472 toenail, 8539 unspecified). Among 16,731 positive nail fungal culture results, median patient age was 55 years (IQR: 39-66); 51.1% were female, with a higher proportion of fingernail specimens (66.9%) from females (Table I). Dermatologists most frequently sent fingernail cultures (62.6%), and podiatrists (22.2%) and family/general medicine physicians (20.1%) most frequently sent toenail specimens. Median time from collection to result date was 23 days (IQR: 15-29).

Frequency of nondermatophyte molds (32.4%) exceeded dermatophytes (25.3%) for toenail specimens. Yeasts were most commonly cultured from fingernail specimens (47.5%), and 30.7% of all specimens were positive without species identification. *Trichophyton rubrum* was the most common species identified (17.1%) (Supplementary Table I, available via Mendeley at <https://data.mendeley.com/datasets/7k7r55f4vd/1>). No substantial differences in fungal species were apparent by region or provider type (Supplementary Tables II and III, available via Mendeley at <https://data.mendeley.com/datasets/7k7r55f4vd/1>). Nail fungal cultures ordered decreased by 90.4% from January 2020 to April 2020; percent positivity remained relatively constant throughout 2019-2022 (range: 36.7% to 53.5%) (Fig 1).

This is the largest US study of nail fungal cultures to date. We found that only half of nail fungal culture results were positive, the proportion of nondermatophytes exceeded dermatophytes, and yeasts predominated fingernail cultures. The proportion of positive fungal cultures might support previous reports showing onychomycosis comprising half of all nail conditions, or might reflect low sensitivity of culture for diagnosing onychomycosis (56% in 1 meta-analysis).² Fungal species could not be identified in nearly one-third of positive specimens and most results took >3 weeks, highlighting limitations of culture for onychomycosis diagnosis. *T. rubrum* was the most common species causing onychomycosis, consistent with other studies despite differing methodology^{1,3}; however, the proportion of nondermatophytes in our analysis (31.8%) exceeded previous reports (2% to 22%).⁴ The relatively high frequency of nondermatophytes might reflect nonideal disinfection or sampling techniques (viable hyphae in subungual debris from proximal nail). Predominance of yeasts in fingernail specimens is consistent with previous studies.⁵ The decline in cultures in early 2020 likely reflects decreased care seeking for nail disorders secondary to the COVID-19 pandemic, with patients potentially presenting later and with more severe disease.

Our study was limited by inability to identify multiple organisms per culture and repeat cultures, which might help distinguish contamination or colonization from true infection.⁴ Data on risk factors, clinical presentation, specimen type (eg, nail plate clippings, subungual debris), sampling technique, treatment, and antifungal resistance were unavailable.

Laboratory diagnosis of onychomycosis is important to ensure appropriate treatment. Our study highlights the challenges with using fungal cultures to guide therapy.

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Table I. Results of fungal cultures* performed on nail specimens at Labcorp, a large national commercial laboratory, by patient demographic characteristics, provider type, and species, March 1, 2019-March 1, 2022†

| Feature | Total n = 16,731 n (%) | Fingernail n = 874 n (%) | Toenail n = 8123 n (%) | Unspecified nail n = 7734 n (%) |
|---|------------------------------|--------------------------------|------------------------------|---------------------------------------|
| Median age in years (IQR) (n = 16,697) | 55 (39-66) | 61 (47-71) | 56 (42-67) | 52 (36-64) |
| Sex (n = 16,625) | | | | |
| Female | 8493 (51.1) | 581 (66.9) | 4127 (51.2) | 3785 (49.2) |
| Male | 8132 (48.9) | 288 (33.1) | 3937 (48.8) | 3907 (50.8) |
| Census region (n = 16,722) | | | | |
| Midwest | 1124 (6.7) | 72 (8.2) | 513 (6.3) | 539 (7.0) |
| Northeast | 4416 (26.4) | 234 (26.8) | 2153 (26.5) | 2029 (26.3) |
| South | 6492 (38.8) | 376 (43.0) | 3131 (38.5) | 2985 (38.6) |
| West | 4377 (26.2) | 188 (21.5) | 2305 (28.4) | 1884 (24.4) |
| Unknown | 313 (1.9) | <10 (n/a) | 21 (0.3) | 288 (3.7) |
| Provider type (n = 12,686) | | | | |
| Family/general practice | 2359 (18.6) | 91 (15.5) | 1137 (20.1) | 1131 (17.5) |
| Hospital | 2127 (16.8) | 44 (7.5) | 470 (8.3) | 1613 (25.0) |
| Dermatology | 2017 (15.9) | 367 (62.6) | 1098 (19.4) | 552 (8.6) |
| Podiatry | 1990 (15.7) | <10 (n/a) | 1254 (22.2) | 733 (11.4) |
| Internal medicine | 1548 (12.2) | 22 (3.8) | 612 (10.8) | 914 (14.2) |
| Multispecialty | 1059 (8.3) | 15 (2.6) | 539 (9.5) | 505 (7.8) |
| Other | 1586 (12.5) | 44 (7.5) | 536 (9.5) | 1006 (15.6) |
| Species‡ | | | | |
| Dermatophytes | 4147 (24.8) | 68 (7.8%) | 2057 (25.3) | 2022 (26.1) |
| <i>Trichophyton</i> | 4128 (24.7) | 67 (7.7) | 2044 (25.2) | 2017 (26.1) |
| <i>T. rubrum</i> | 2856 (17.1) | 34 (3.9) | 1404 (17.3) | 1418 (18.3) |
| Other specified <i>Trichophyton</i> species | 210 (12.6) | <10 (n/a) | 106 (1.3) | 98 (1.3) |
| Unspecified <i>Trichophyton</i> species | 1062 (6.3) | 27 (3.1) | 534 (6.6) | 501 (6.5) |
| Other dermatophytes | 19 (0.1) | <10 (n/a) | 13 (0.2) | <10 (n/a) |
| Nondermatophyte molds | 5328 (31.8) | 219 (25.1) | 2629 (32.4) | 2480 (32.1) |
| Dematiaceous molds | 2068 (12.4) | 65 (7.4) | 1048 (12.9) | 955 (12.3) |
| <i>Aspergillus</i> species | 1191 (7.1) | 57 (6.5) | 593 (7.3) | 541 (7.0) |
| <i>Fusarium</i> species | 850 (5.1) | 25 (2.9) | 399 (4.9) | 426 (5.5) |
| Other nondermatophyte molds | 1219 (7.3) | 72 (8.2) | 589 (7.3) | 558 (7.2) |
| Yeasts | 2120 (12.7) | 415 (47.5) | 646 (8.0) | 1059 (13.7) |
| <i>Candida</i> species | 1776 (10.6) | 395 (45.2) | 504 (6.2) | 877 (11.3) |
| Other yeasts | 344 (2.1) | 20 (2.3) | 142 (1.7) | 182 (2.4) |
| Unspecified fungus | 5137 (30.7) | 172 (19.7) | 2791 (34.4) | 2174 (28.1) |

*We used Logical Observation Identifiers Names and Codes (LOINC) codes to identify fungal cultures (568-6, 569-4, 580-1, 601-5, 17947-3, 17948-1, 17949-9, 18482-0, 42804-5, 51723-5). Among 929,605 fungal cultures ordered during March 1, 2019-March 1, 2022, 553,129 (59.5%) had a specimen type listed; of those, 35,257 (6.4%) were nail specimens. Of those, 499 (1.4%) were not tested or the result was unavailable.

†Table cells with fewer than 10 patients are presented as "<10."

‡1606 (9.6%) of fungal culture results had >1 species identified; however, we were not able to identify species combinations.

IRB approval status: Not required.

This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy (eg, 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq).

Key words: culture; dermatophyte; epidemiology; laboratories; onychomycosis; tinea unguium; United States.

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Conflicts of interest

Dr Lipner has served as a consultant for BelleTorus Corporation and Ortho-dermatologics.

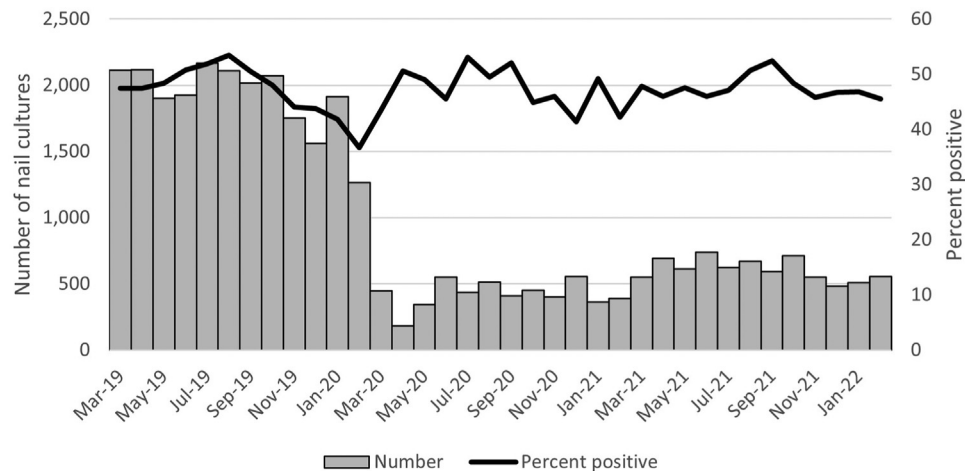


Fig 1. Monthly fungal cultures ordered on nail specimens and percent positive at Labcorp, a large national commercial laboratory, March 1, 2019-March 1, 2022.

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