

Non-invasive Detection of Co-infections in Hospitalized Patients with COVID-19 Using the Karius® Test, A Plasma-based Next-Generation Sequencing Test for Microbial Cell-free DNA

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Background

Superinfections occur in up to 40% of the patients with COVID-19 but it is difficult to identify the pathogens through the usual invasive procedures due to patient instability and risk of exposure and pro-calcitonin is insensitive in this setting.¹⁻³ The Karius® Test may be used to rapidly and non-invasively identify fungal, viral and bacterial pathogens in one process, using a single plasma sample.⁴⁻⁶

Methods

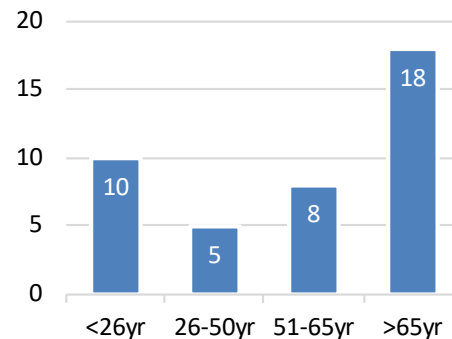
The Karius® Test (KT) is conducted in a CLIA certified/CAP-accredited laboratory in Redwood City, California. Microbial cell free DNA (mcfDNA) is extracted and next-generation sequencing (NGS) performed; microbial sequences are aligned to a curated database of > 1000 organisms. Organisms present above a statistical threshold are reported.⁴

Results

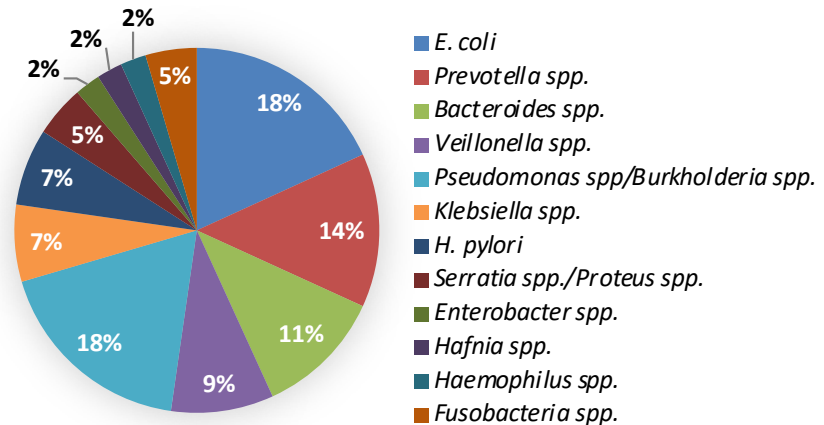
Fifty-three specimens from patients with COVID-19 were processed between 4/1/20 and 9/25/20. Twenty of 53 (38%) were female and 33 (62%) were male. 39 (74%) were adults; 14 (26%) were children or young adults (Figure 1). Twelve patients (22.6%) did not have a concomitant pathogen: (median age 41yr; min 2yr-max 68yr; p=0.057). The median age of those with a concomitant pathogen was 63yr (min 0.5 max 91yr); 37/41 (90.2%) had two or more co-pathogens. The number of concomitant pathogens was significantly higher among patients ≥65yr (3.4, n=18) as compared to patients <65yr (2.2, n=23; p=0.009). The number of concomitant pathogens was similar between males (2.5, n=25) and females (3.1, n=18; p>0.05).

Results

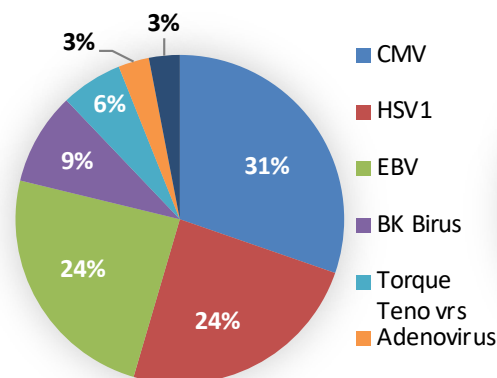
Figure 1. Age Distribution of Patients with COVID-19 and a Concomitant Pathogen



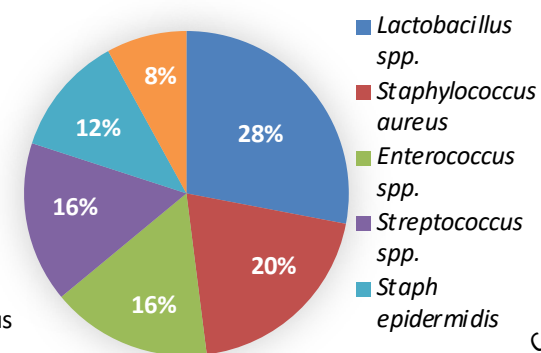
Gram (-) Bacteria (N=33, 31.7%)



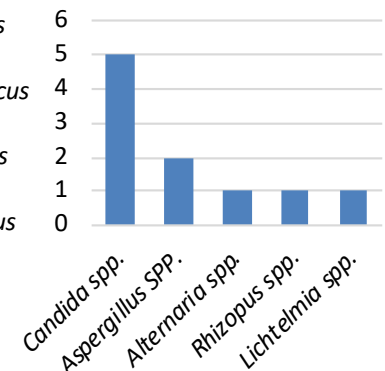
Viruses (N=34; 32.7%)



Gram (+) Bacteria (N=25; 24%)



Fungi (N=10, 9.6%)



Conclusions

Reactivation of herpesviruses, bacterial & fungal infections are common among hospitalized patients with COVID-19. The Karius® Test provides a rapid, non-invasive means to identify co-infecting pathogens using a single plasma sample.

¹Chen Xi et al. *Appl Microbiol Biotechnol* 2020 ;104:7777 ²Zhu X et al. *Virus Res* 2020; 285:198005. ³van Arkel et al. *Am J Respir Crit Care Med.* 2020; 202:132 ⁴Blauwkamp et al. *Nat Microbiol.* 2019;4:663 ⁵Farnaes et al. *Diagn Microbiol Infect Dis.*;94:188-191 ⁶Rossoff et al. *Open Forum Infect Dis.* 2019; 6(8)
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