

C.diff and Antibiotic Stewardship

Sarah Khoury

September 2022

Clostridioides difficile (aka *Clostridium difficile* or *C. diff*) infections are notoriously difficult to treat because the spores the bacteria create often causes recurrent infections.¹ Annually, the infection is responsible for 14,000 deaths and can accrue over a billion dollars of extra health care costs.² A majority of *C. diff* infections are healthcare associated and can be caused by the incorrect usage of antibiotics.^{2,3,4} While it may be easy to place the blame on clinicians, the failure is in the lack of testing that is efficient, and fast.⁵

Martinez et al. strengthens the connection between gut microbiota and *C. diff* in the July 2022 issue of the journal *Pathogens*.³ The paper explores why some colonizations of *C. diff* develop into infection and why some colonizations remain asymptomatic. Gut flora diversity and richness appears to be the deciding factor if a person exposed to *C. diff* will be subject to infection. One of the main culprits of gut flora disruption is the use of antibiotics. Patients using antibiotics are 3.7 times more likely to develop a *C. diff* infection. The antibiotics clindamycin, cephalosporins, carbapenem, and fluoroquinolone contribute the largest risk of infection.

Two bacteria that seem to protect against infection are involved in the synthesis of secondary bile acids: Ruminococcus and Lachnospiraceae.³ The authors argue that bile acids created by gut flora are protective against *C. diff* infection. Bile acids come in two types: primary and secondary. Primary bile acids are made by the liver and create a hospitable environment for *C. diff* spores. Secondary bile acids are produced by bacteria within the gut and inhibit the activation of *C. diff* spores. Antibiotics reduce the number of bacteria that create secondary bile acids. When secondary bile acids are inhibited, primary bile acids allow *C. diff* to proliferate by the germination of spores.

Empiric antibiotics are often necessary for the timely treatment of infections but the broad-spectrum approach is likely to cause harm to gut flora.^{3,4} The CDC recommends the use of targeted antibiotics and avoidance of unnecessary antibiotics to prevent *C. diff* infections.⁶ At Labtest.bio, a division of Pro-Lab Diagnostics USA, antibiotic stewardship is important to us. Our customizable diagnostics panels for common illnesses like respiratory infections (pending validation), UTI (pending validation) and *C.diff* (pending validation) can help clinicians make informed decisions. We provide fast and efficient diagnostic tests to help clinicians provide the safest treatments for their patients.

REFERENCES

- ¹ Chiu, C. W., Tsai, P. J., Lee, C. C., Ko, W. C., & Hung, Y. P. (2021, December). Inhibition of spores to prevent the recurrence of *Clostridioides difficile* infection - A possibility or an improbability? *Journal of Microbiology, Immunology and Infection*, 54(6), 1011-1017. <https://doi.org/10.1016/j.jmii.2021.06.002>
- ² *Making Health Care Safer - Stopping C. difficile Infections*. (2012, March 6). Centers for Disease Control and Prevention. Retrieved September 23, 2022, from <https://www.cdc.gov/vitalsigns/hai/stoppingdifficile/index.html>
- ³ Martinez, E., Taminiau, B., Rodriguez, C., & Daube, G. (2022, July 8). Gut Microbiota Composition Associated with *Clostridioides difficile* Colonization and Infection. *Pathogens*, 11(7), 781. <https://doi.org/10.3390/pathogens11070781>
- ⁴ *Nearly half a million Americans suffered from Clostridium difficile infections in a single year* | CDC Online Newsroom | CDC. (n.d.). Retrieved September 23, 2022, from <https://www.cdc.gov/media/releases/2015/p0225-clostridium-difficile.html#:~:text=difficile,.death%20in%20the%20United%20States.>
- ⁵ *Antibiotic Use in the United States, 2021 Update*. (n.d.). Retrieved September 23, 2022, from <https://www.cdc.gov/antibiotic-use/stewardship-report/current.html>
- ⁶ *Core Elements of Hospital Antibiotic Stewardship Programs | Antibiotic Use* | CDC. (n.d.). Retrieved September 23, 2022, from <https://www.cdc.gov/antibiotic-use/core-elements/hospital.html>