

A Retrospective Study: Correlation between Enterococcus Infections and Bone Carcinoma Incidence

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Abstract : Introduction Enterococcus is a vast genus of lactic acid bacteria, gram-positive cocci species. They are common commensal organisms in the intestines of humans: *E. faecalis* (90-95%) and *E. faecium* (5-10%). Rare groups of infections can occur with other species, including *E. casseliflavus*, *E. gallinarum*, and *E. raffinosus*. The most common infections caused by Enterococcus include urinary tract infections, biliary tract infections, subacute endocarditis, diverticulitis, meningitis, septicemia, and spontaneous bacterial peritonitis. The treatment for sensitive strains of these bacteria includes ampicillin, penicillin, cephalosporins, or vancomycin, while the treatment for resistant strains includes daptomycin, linezolid, tygecycline, or streptogramin. Enterococcus faecalis CECT7121 is an encouraging nominee for being considered as a probiotic strain. *E. faecalis* CECT7121 enhances and skews the profile of cytokines to the Th1 phenotype in situations such as vaccination, anti-tumoral immunity, and allergic reactions. It also enhances the secretion of high levels of IL-12, IL-6, TNF alpha, and IL-10. Cytokines have been previously associated with the development of cancer. The intention of this study was to therefore evaluate the correlation between Enterococcus infections and incidence of bone carcinoma. Methods A retrospective cohort study (2010-2019) was conducted through a Health Insurance Portability and Accountability Act (HIPAA) compliant national database and conducted using International Classification of Disease (ICD) 9th and 10th codes for bone carcinoma diagnosis in a previously Enterococcus infected population. Patients were matched for age range and Charlson Comorbidity Index (CCI). Access to the database was granted by Holy Cross Health for academic research. Chi-squared test was used to assess statistical significance. Results A total number of 17,056 patients was obtained in Enterococcus infected group as well as in the control population (matched by Age range and CCI score). Subsequent bone carcinoma development was seen at a rate of 1.07% (184) in the Enterococcal infectious group and 3.42% (584) in the control group, respectively. The difference was statistically significant by $p = 2.2 \times 10^{-16}$, Odds Ratio = 0.355 (95% CI 0.311 - 0.404) Treatment for enterococcus infection was analyzed and controlled for in both enterococcus infected and noninfected populations. 78 out of 6,624 (1.17%) patients with a prior enterococcus infection and treated with antibiotics were compared to 202 out of 6,624 (3.04%) patients with no history of enterococcus infection (control) and received antibiotic treatment. Both populations subsequently developed bone carcinoma. Results remained statistically significant ($p < 2.2 \times 10^{-16}$), Odds Ratio = 0.456 (95% CI 0.396-0.525). Conclusion This study shows a statistically significant correlation between Enterococcus infection and a decreased incidence of bone carcinoma. The immunologic response of the organism to Enterococcus infection may exert a protecting mechanism from developing bone carcinoma. Further exploration is needed to identify the potential mechanism of Enterococcus in reducing bone carcinoma incidence.

Keywords : anti-tumoral immunity, bone carcinoma, enterococcus, immunologic response

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