

# Implications of Human Cytomegalovirus as a Protective Factor in the Pathogenesis of Breast Cancer

Marissa Dallara<sup>1</sup>, Amalia Ardeljan<sup>2</sup>, Lexi R. Frankel<sup>3</sup>, Nadia Obaed<sup>1</sup>, Naureen Rashid<sup>4</sup>, Omar Rashid<sup>5</sup>

1. Allopathic Medicine, Nova Southeastern University Dr. Kiran C. Patel College of Allopathic Medicine, Fort Lauderdale, USA 2. Michael and Dianne Biennes Comprehensive Cancer Center, Holy Cross Health, Fort Lauderdale, USA 3. College of Allopathic Medicine, Nova Southeastern University Dr. Kiran C. Patel College of Allopathic Medicine, Davie, USA 4. Allopathic Medicine, Nova Southeastern University Dr. Kiran C. Patel College of Allopathic Medicine, Fort Lauderdale, USA 5. Michael and Dianne Biennes Comprehensive Cancer Center, Holy Cross Health, Fort Lauderdale, USA

**Corresponding author:** Marissa Dallara, md2685@mynsu.nova.edu

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## Abstract

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## Background

Human Cytomegalovirus (HCMV) is a ubiquitous virus that remains latent in approximately 60% of individuals in developed countries. Viral load is kept at a minimum due to a robust immune response that is produced in most individuals who remain asymptomatic. HCMV has been recently implicated in cancer research because it may impose oncomodulatory effects on tumor cells of which it infects, which could have an impact on the progression of the cancer. HCMV has been implicated in increased pathogenicity of certain cancers such as gliomas, but in contrast it can also exhibit anti-tumor activity. HCMV seropositivity has been recorded in tumor cells, but this may also have implications in decreased pathogenesis of certain forms of cancer such as leukemia as well as increased pathogenesis in others. This study aimed to investigate the correlation between cytomegalovirus and the incidence of breast cancer.

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## Methods

The data used in this project was extracted from a Health Insurance Portability and Accountability Act (HIPAA) compliant national database to analyze the patients infected versus patients not infected with cytomegalovirus using ICD-10, ICD-9 codes. Permission to utilize the database was given by Holy Cross Health, Fort Lauderdale for the purpose of academic research. Data analysis was conducted using standard statistical methods.

## Results

The query was analyzed for dates ranging from January 2010 to December 2019, which resulted in 14,309 patients in both the infected and control groups, respectively. The two groups were matched by age range and CCI score. The incidence of breast cancer was 1.642% and 235 patients in the cytomegalovirus group compared to 4.752% and 680 patients in the control group. The difference was statistically significant by a p-value of less than  $2.2 \times 10^{-16}$  with an odds ratio of 0.43 (0.4 to 0.48) with a 95% confidence interval. Investigation into the effects of HCMV treatment modalities, including Valganciclovir, Cidofovir, and Foscarnet, on breast cancer in both groups was conducted, but the numbers were insufficient to yield any

statistically significant correlations.

## Conclusion

This study demonstrates a statistically significant correlation between cytomegalovirus and a reduced incidence of breast cancer. If HCMV can exert anti-tumor effects on breast cancer and inhibit growth, it could potentially be used to formulate immunotherapy that targets various types of breast cancer. Further evaluation is warranted to assess the implications of cytomegalovirus in reducing the incidence of breast cancer.

**Keywords**—Human cytomegalovirus, breast cancer, immunotherapy, anti-tumor

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