

Human Papillomavirus: A Comprehensive Overview of Infection, Cancer Risks, and Prevention Through Vaccination

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Abstract

Human papillomavirus (HPV) is a prevalent sexually transmitted infection with over 200 distinct strains, most of which are benign. However, persistent infection with high-risk HPV types, particularly HPV 16 and 18, is a leading cause of various cancers, including cervical, anal, vulvar, vaginal, penile, and oropharyngeal cancers. HPV infects the skin and mucosal membranes, and in some cases, high-risk strains can lead to malignancies by interfering with cell cycle regulation and inhibiting tumor suppressor proteins. The development of the HPV vaccine has been a significant advancement in preventing HPV-related cancers. Current vaccines, such as Gardasil and Cervarix, target both high-risk and low-risk HPV types, protecting against strains

linked to cancer and genital warts. Vaccination is most effective when administered before exposure to the virus, typically recommended for boys and girls between the ages of 9 and 15. Screening methods, including Pap smears and HPV testing, play a crucial role in the early detection of precancerous changes, particularly in cervical cancer. While the immune system usually clears HPV infections, those with weakened immunity are at higher risk of persistent infections and subsequent cancers. The combination of vaccination and regular screening can significantly reduce the burden of HPV-related diseases. Ongoing public health campaigns promoting vaccination and screening are essential for decreasing the incidence of

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preventable cancers worldwide. This article explores the characteristics, infection mechanism, and cancer association of HPV, emphasizing the importance of vaccination and early detection.

Keywords: papillomavirus, cancer, prevention, infection, vaccine.