

## INTRODUCTION

In the United States, around 14 million people are becoming infected with HPV (Human Papillomavirus) every year, with a total of 79 million people infected (Centers for Disease Control). However, some people distrust the vaccine, especially after an incident that happened in Japan in 2013, where “complaints of patients with widespread pain or movement disorders occurring after HPV immunization began to circulate, and the national news media soon began to question the vaccine’s safety” (Nature). Doctors say that HPV vaccine is safe, but does the vaccine really work?

Cutaneous Warts	1, 2, 3, 4, 7, 10, 26, 27, 28, 29, 38, 41, 49, 57, 63, 65, 75, 76, 77, 80, 92, 95, 96	Many EV-related viruses have also been found in warts in immunocompromised subjects, although with low frequency
Epidermodysplasia verruciformis (EV)	2, 3, 5, 8, 9, 10, 12, 14, 15, 17, 19, 20, 21, 22, 23, 24, 25, 36, 38, 46, 47, 50	
Recurrent respiratory papillomatosis	6, 11	
Focal epithelial hyperplasia (Heck's disease)	13, 32	
Conjunctival papillomas	6, 11, 16	
Condylomata acuminata	6, 11, 30, 42, 43, 45, 51, 53, 54, 55, 56, 62, 70, 84, 87, 90, 91	
Cervical (vaginal, vulvar, anal or penile) intraepithelial neoplasia	2, 6, 7, 11, 16, 18, 26, 27, 30, 31, 33, 34, 35, 39, 42, 43, 44, 45, 51, 52, 53, 56, 57, 58, 59, 60, 61, 62, 64, 66, 67, 68, 69, 70, 71, 73, 74, 82, 83, 84, 85, 86, 87, 89, 91, 94, 97, 101, 102, 103, 106	Many genital PVs have been found associated to benign and malignant lesions of the aerodigestive mucosa. HPV2, 7 27 and 57 are also capable of infecting the epidermis outside the genital area.
Cervical carcinoma (high risk types, data from (Munoz, N. <i>et al.</i> , 2003))	16, 18, 26, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68, 73, 82	The listed types accounted for 93.5% of cancers. A few additional known HPVs, phylogenetically related to these high risk types, were not looked for in the study: 30, 53, 67 and 69.

## BACKGROUND

HPV is a sexually transmitted disease world wide, with more than 100 types. HPV can be found on the surface of skin, vagina, anus, vulva, cervix, penis, etc. Many people do not have symptoms having HPV but some types of HPV can cause cervical cancer (types 16 & 18)) or genital warts (types 6 & 11) for both women and men. The type of HPV I am focusing on for this research is genital warts and cervical cancer. The chart above shows the different types that can cause each of the illnesses:

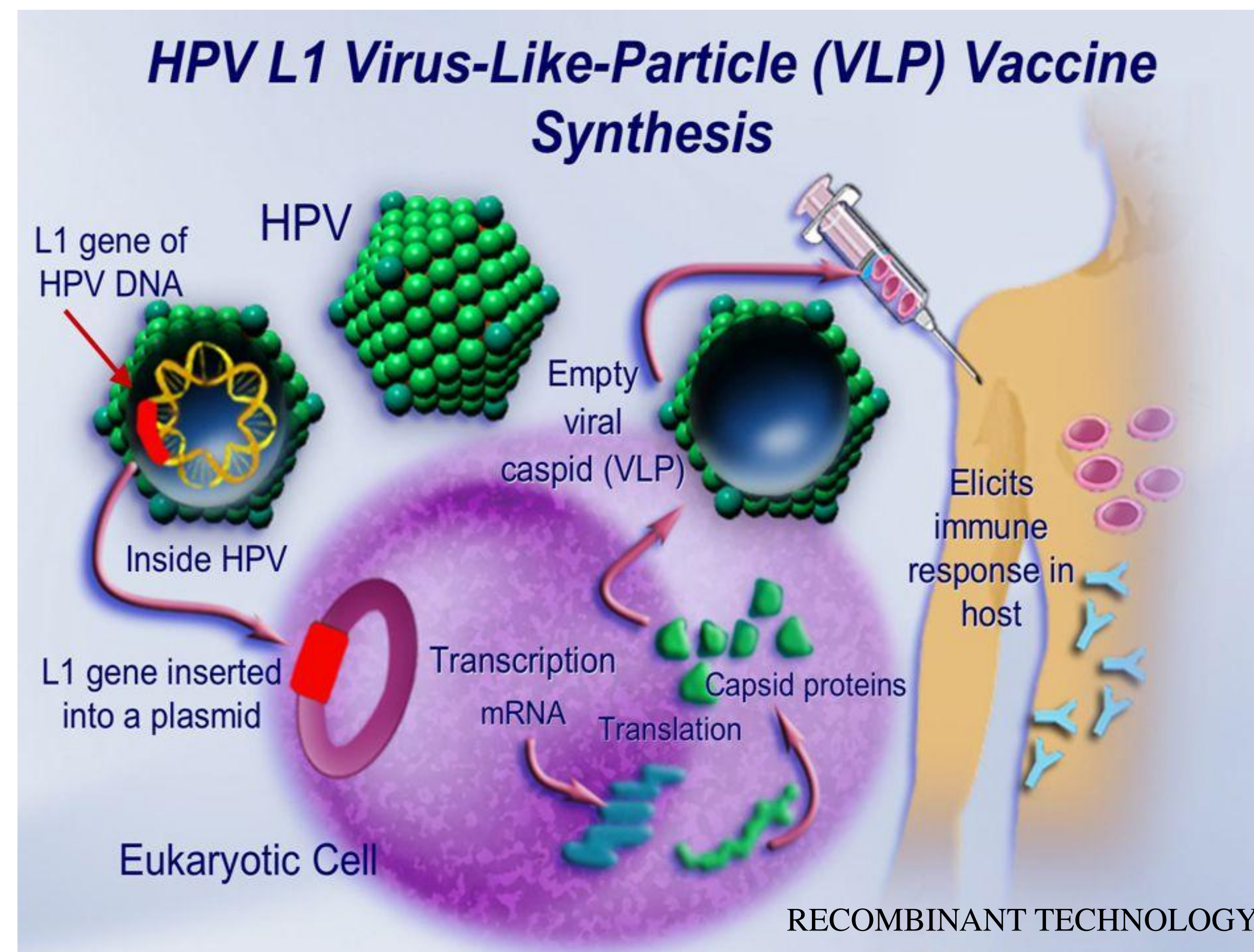


Diagram 2: VLP (virus like proteins) and how they are made for the HPV

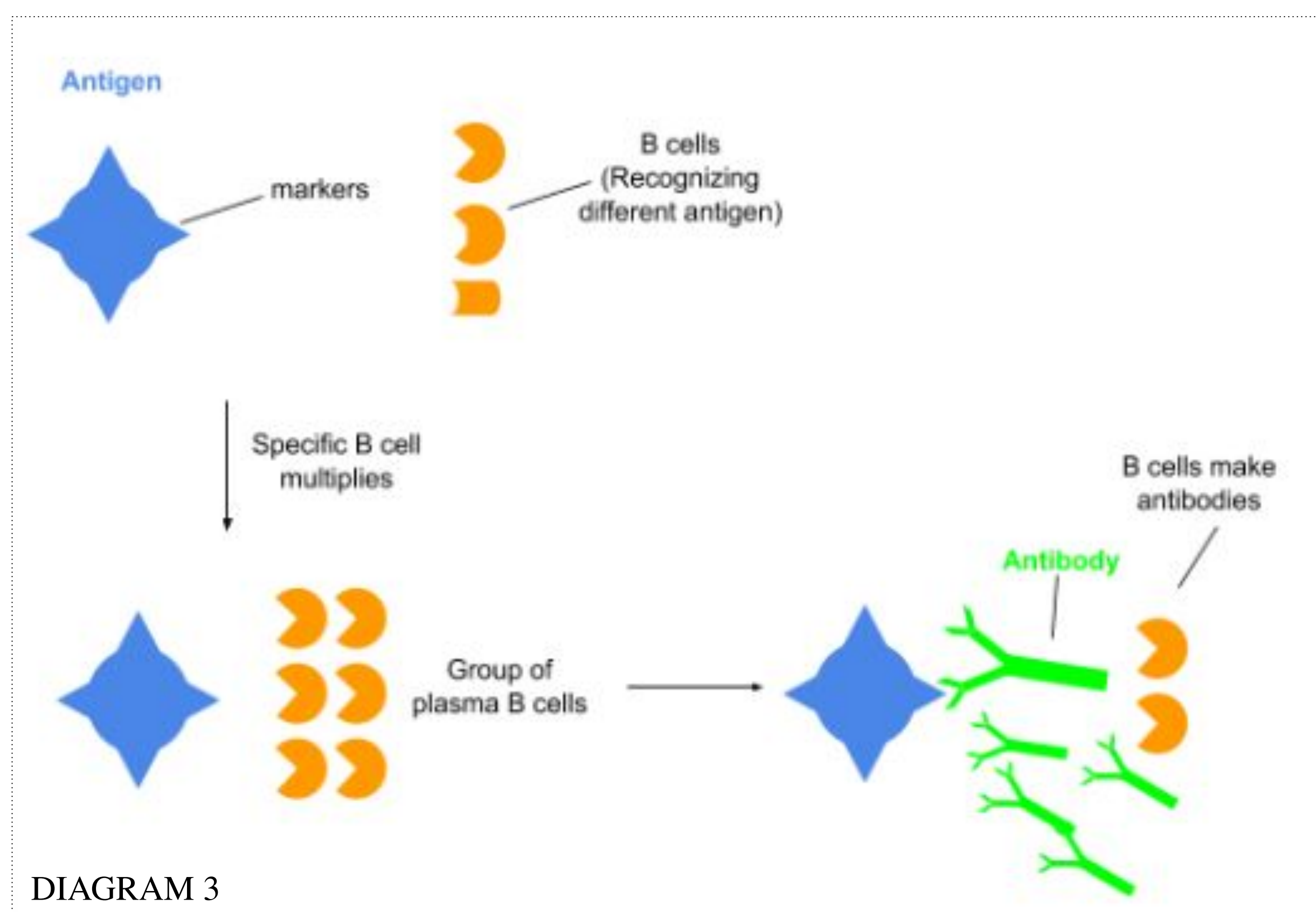


Diagram 3: how antibodies are made when HPV vaccine is inserted in to a body for immunity

## REFERENCES

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## ABOUT THE VACCINE & THE SAFETY

Adverse events discovered were, “seizures; disturbance of consciousness; systemic pain, including headache, myalgia, arthralgia, back pain and other pain; motor dysfunction, such as paralysis, muscular weakness, exhaustion and involuntary movements”. Invention by Merck and Co. (New Jersey); & approved by the FDA in 2009. HPV vaccine used in the USA is Gardasil which prevents types 6, 11, 16, & 18. The vaccine is a virus like protein; a protein made to look like the actual structure of the virus. Proteins in vaccine are manufactured in yeast cells (*S. cerevisiae*) using recombinant technology. The body makes antibodies against the foreign “protein virus,” and can get immune to it. When actual virus invades the body, it can make the B and T cells because the body will recognize the shape of virus and protect the body against it. (Diagram 3). Doctors usually recommend taking the HPV vaccine to prevent new HPV infections. A study done at Johns Hopkins states, “parental concerns that steer young people away from vaccination [tending] to focus on safety worries, lack of necessity, [and] knowledge about HPV and absence of physician recommendation,” doubts people from taking the vaccine. Furthermore, from the incident that happened in Japan, the Indian Journal Of Medical Ethics states that, “The vaccination rate was initially low. However, after a campaign for the promotion of the vaccine, which led to government subsidisation of the cost of the vaccine in November 2010, the vaccination rate increased exponentially. This was followed by an unexpected increase in reports of adverse events (AEs).”

## CONCLUSION

What I found out was that these vaccines are designed to maintain an extremely high antibody titre over a long period of time. Since prolonged inflammatory reactions associated with infection are known to cause autoimmune diseases and worsening of autoimmune reactions, longtime antigen stimulation with HPV vaccines might also induce complex autoimmune reactions via a mechanism similar to that seen with prolonged infection. However, there is no concrete evidence on if the vaccine actually caused the adverse events because no one has proved it yet. It is also true that the benefits outweigh the risks that barely happen.