

HPV vaccine

Bioengineering 100

Fall 2016

What does the HPV vaccine do?

Did You Know?

Human Papillomavirus (HPV)



National Cancer Institute

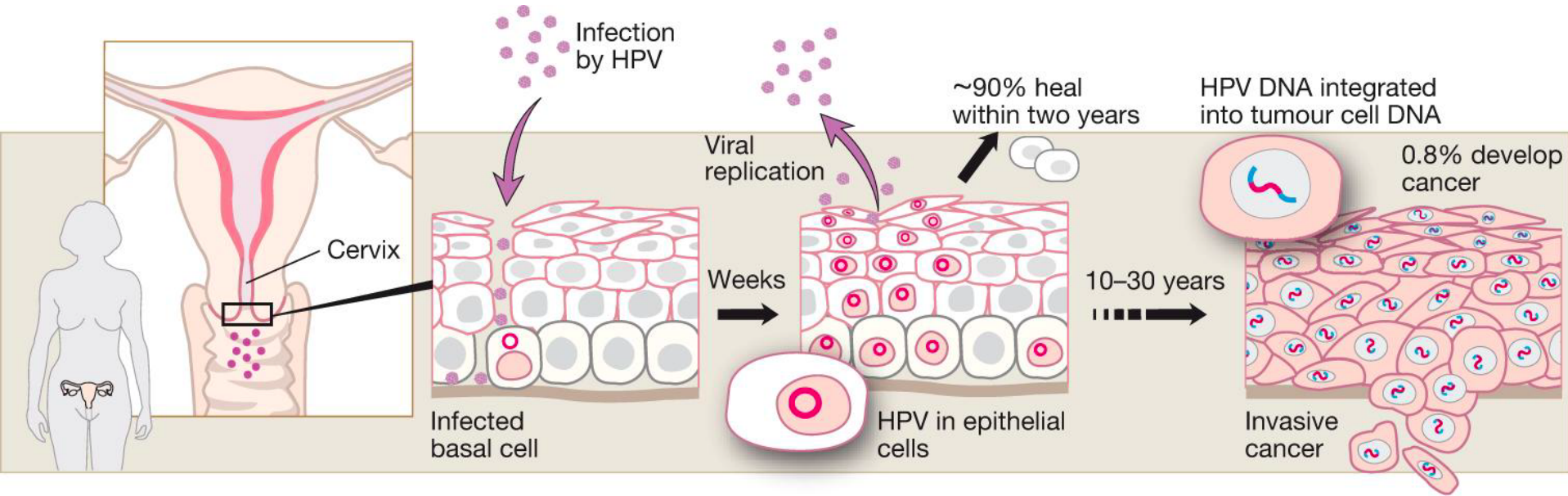
I have had the HPV vaccine.

The discoveries of human papilloma viruses that cause cervical cancer and of human immunodeficiency virus

Professor Harald zur Hausen, emeritus Scientific Director and Chairman of the Management Board of the German Cancer Research Center in Heidelberg, has made seminal observations that identify novel human papilloma viruses as key contributors to cervical cancer. Cervical cancer is the second most common cancer among women. Professor zur Hausen's discoveries include detection of novel human papilloma virus types, isolation of the human papilloma virus types 16 and 18 genomes, and expression of specific papilloma virus DNA genes integrated into the tumour host cell genome. These findings have led to an understanding of cervical carcinogenesis, a characterization of the natural history of the human papilloma virus infection, and paved the way for the development of preventive vaccines.

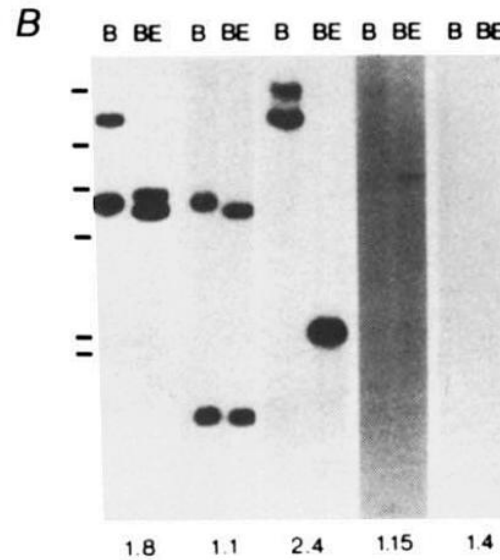
2008

Progression of HPV to cancer

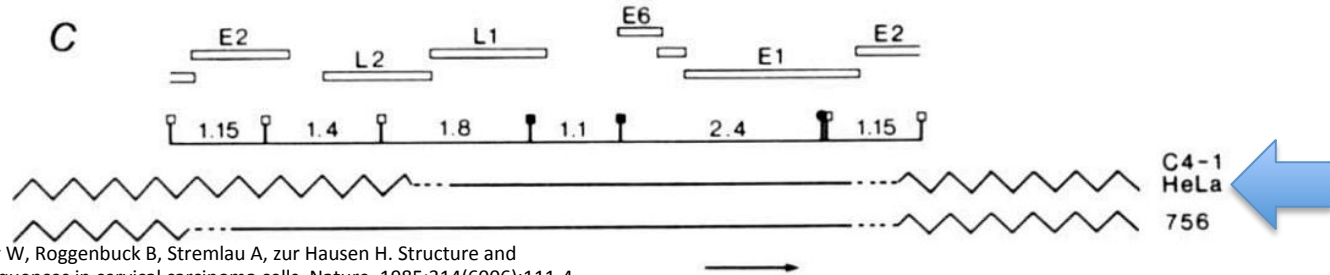


Guess what cell line some of this work was done with??

Positive hybridization of HeLa DNA with subgenomic fragments of HPV18 DNA as probes.



Integration patterns of HPV18 DNA sequences into the cellular genome in HeLa, C4-1 and 756 cells



Certain HPVs cause cancer

Table 2 Size of the IARC multicentre case-control study and human papillomavirus (HPV) DNA prevalence

	Controls		Cervical cancer			
			Adeno and mixed		Squamous	
No. countries	N	HPV DNA (% +ve)	N	HPV DNA (% +ve)	N	HPV DNA (% +ve)
9*	2491	13.4	–	–	2365	90.7
6†	1466	15.4	141	91.9	2280	96.6

*Brazil, Morocco, Paraguay, the Philippines, Thailand, Peru, Mali, Spain, and Colombia.

†Brazil, Morocco, Paraguay, the Philippines, Thailand, and Peru.

HPV Types Differ in their Disease Associations

~40 Types

**Mucosal
sites of infection**

**Cutaneous
sites of infection**

~ 80 Types

**High risk (oncogenic)
HPV 16, 18 most common**

**Low risk (non-oncogenic)
HPV 6, 11 most common**

**Cervical Cancer
Anogenital Cancers
Oropharyngeal Cancer Cancer
Precursors
Low Grade Cervical Disease**

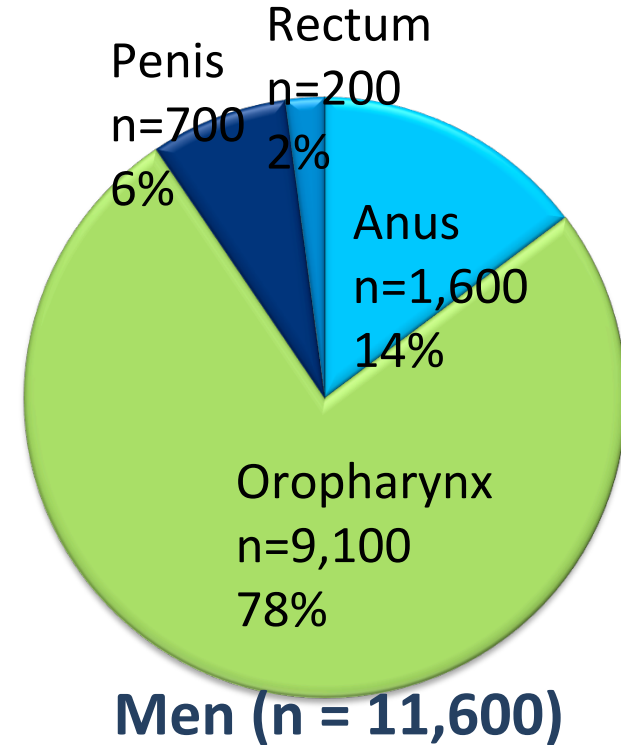
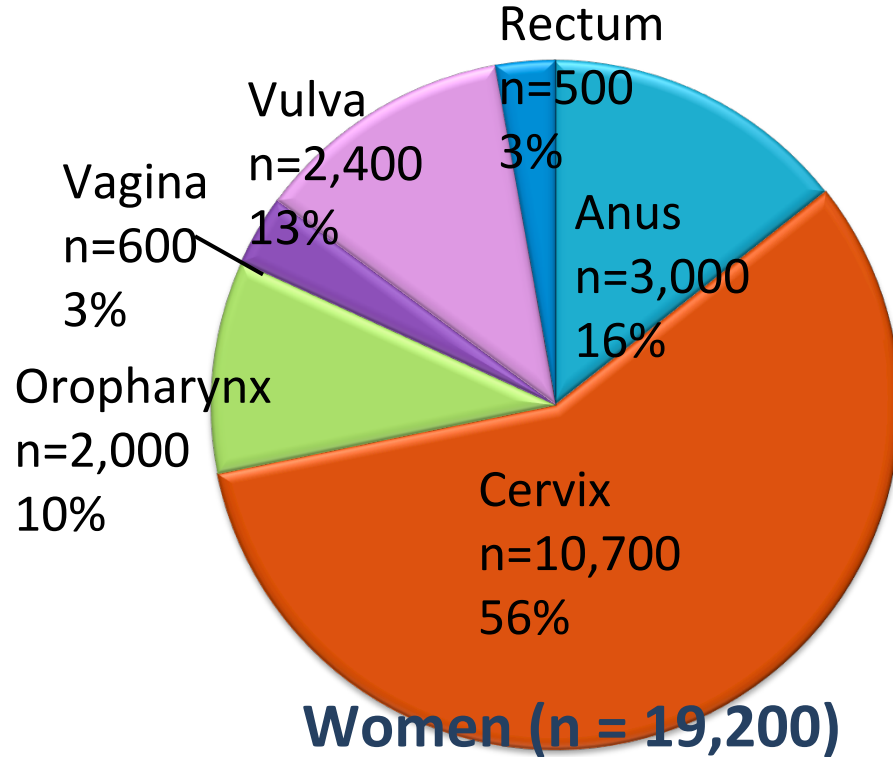
**Genital Warts
Laryngeal Papillomas
Low Grade Cervical Disease**

**"Common"
Hand and Foot
Warts**

HPV Infection

- Most females and males will be infected with at least one type of mucosal HPV at some point in their lives
 - Estimated 79 million Americans currently infected
 - 14 million new infections/year in the US
 - HPV infection is most common in people in their teens and early 20s
- Most people will never know that they have been infected

New Cancers Caused by HPV per Year United States 2008-2012



Cervical Cancer

- Cervical cancer is the most common HPV-associated cancer among women
 - 500,000+ new cases and 275,000 attributable deaths world-wide in 2008
 - ~11,000 new cases and 4,000 attributable deaths in 2012 in the U.S.
- 25% cervical cancers occur in women who are between the ages of 20 and 39

Cervical pre-cancer in U.S. females

- 1.4 million new cases of low grade cervical dysplasia
- 330,000 new cases of high grade cervical dysplasia
- PAP smears introduced in 1950's has reduced cervical cancer rates in the US by more than 60%



HPV vaccine is cancer prevention.

Talk to the doctor
about vaccinating
your 11–12 year old
sons and daughters
against HPV.

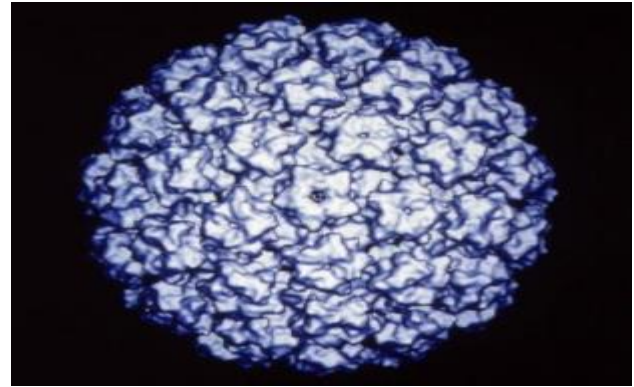
#UCanStopHPV

Evidence-Based HPV Disease Prevention

HPV VACCINE

HPV Prophylactic Vaccines

- Recombinant L1 capsid proteins that form “virus-like” particles (VLP)
- Non-infectious and non-oncogenic
- Produce higher levels of neutralizing antibody than natural infection



HPV Virus-Like Particle

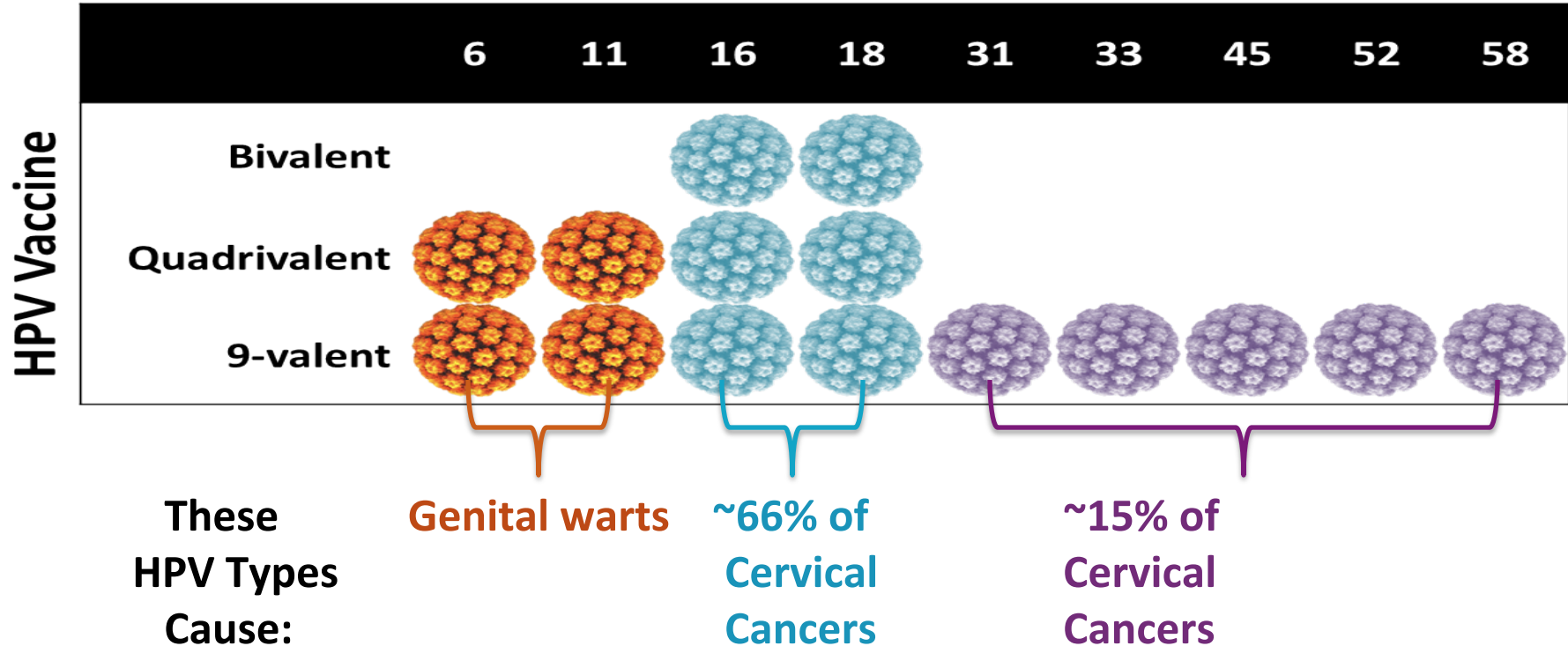
HPV Vaccines Currently Licensed in U.S.

	Bivalent 2vHPV (Cervarix)	Quadrivalent 4vHPV (Gardasil)	9-Valent 9vHPV (Gardasil 9)
Manufacturer	GlaxoSmithKline	Merck	Merck
HPV Types Included	16, 18	6, 11, 16, 18	6, 11, 16, 18, 31, 33, 45, 52, 58
Contraindications	Hypersensitivity to latex*	Hypersensitivity to yeast	Hypersensitivity to yeast
Dose Schedule	3 dose series: 0, 1, 6 months	3 dose series: 0, 2, 6 months	3 dose series: 0, 2, 6 months

* May be present in tip of pre-filled syringes

HPV Vaccine Comparison

HPV Types Included in Vaccine



HPV Vaccine Recommendation

Girls & Boys can start HPV vaccination at age 9

Preteens should finish HPV vaccine series by 13th birthday



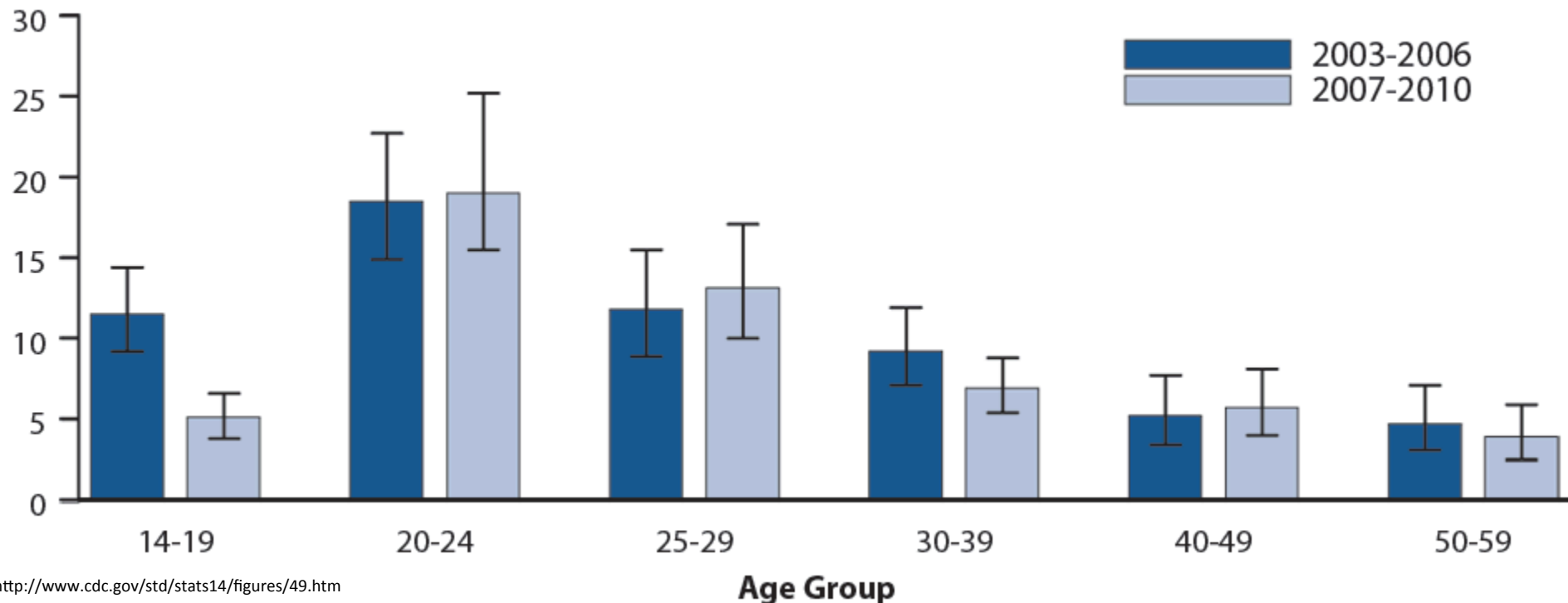
Plus girls 13-26 years old
who haven't started or
finished HPV vaccine series



Plus boys 13-21 years old
who haven't started or
finished HPV vaccine series

Human Papillomavirus — Cervicovaginal Prevalence of Types 6, 11, 16 and 18, National Health and Nutrition Examination Survey, 2003–2006 and 2007–2010

Prevalence, %



The HPV Vaccine is an important
preventative measure against
cancer.

Agree or Disagree?