

Figure S1. Normal tissues are refractory to HPV infection *in vivo* unless traumatized. HPV16 RFP PsV were administered intraperitoneally, intranasally, intrabronchially or intravenously into naive animals or animals that had been locally pre-treated with 2% nonoxynol-9 (N9) via the same route (not in the case of the intravenous animals). After 72hr, the tissues are harvested, frozen, sectioned and VLPs are imaged directly by detecting RFP signal by microscopy (Blue=DAPI, Red=PsV infection). The first row depicts tissues from animals that did not receive N9 (panels, a, c, e, g and i) and the second row depicts tissues from animals after N9 pre-treatment (b, d, f, h and j). Images are representative of 1-3 animals.

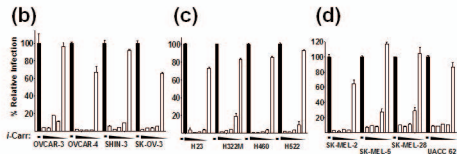
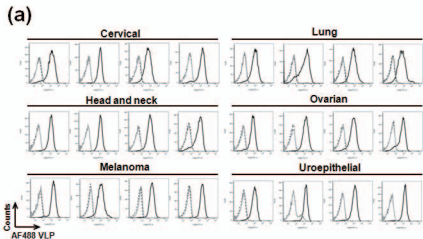


Figure S2. HPV16 VLP binding to and PsV infection of tumor cell lines is competitively inhibited by ι -carrageenan. (a) Flow histograms of 10 μ g/ml AF488 VLPs bound to cells in the absence (black line) or presence (gray line) of 1% ι -carrageenan (negative control, dashed line). Tumor cell lines tested and shown in the following order: Cervical (HeLa, SiHa, C 33A, CaSki); Head and Neck (CAL-33, HSC-3, UPCI SCC-90, UPCI SCC-154); Melanoma (SK-MEL 2, SK-MEL 5, SK-MEL 28, UACC-62); Lung (NCI-H23, NCI-H322M, NCI-H460, NCI-H522); Ovarian (SK-OV-3, A2780, OVCAR-3, OVCAR-4); Uroepithelial (J82, RT112, T24, UMUC-5). (b) Dose response of ι -carrageenan inhibition of PsV infection of (b) ovarian, (c) lung and (d) melanoma cancer cell line panels. ι -Carrageenan concentration begins with 1% and is serially diluted ten-fold (single experiment, data represent triplicates).

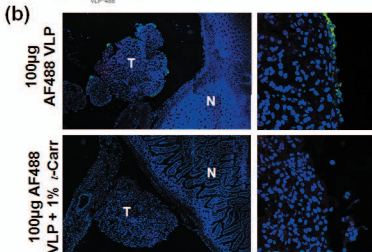
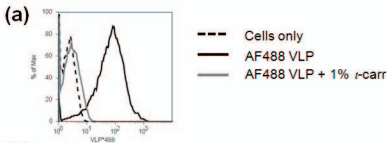


Figure S3. 1% ι -Carrageenan blocks AF488 HPV VLP binding to SHIN-3 DSR cells *in vitro* and *in vivo*. (a) 2µg/ml AF488 coupled VLPs that were used *in vivo* (see Figure 4) were also tested on SHIN-3 DSR cells *in vitro* for binding (black line) and inhibition of binding by 1% ι -carrageenan (gray line) (negative control, dashed line). (b) Tumor nodules from Figure 4 were frozen, sectioned and examined for VLP localization using confocal microscopy (Blue=DAPI, Green=AF488 VLP, Red=RFP). AF488 binding to tumor nodules but not normal intestinal epithelia (upper panel) is greatly reduced in the presence of 1% ι -carrageenan (lower panel). Left panel images are composites pieced together from several 40x images taken in succession from individual tissues. Right panel images are single 40x taken from representative tumor nodules. T = tumor, N = normal tissue. RFP signal of tumors is low after fixation and is known to decrease over time once implanted *in vivo*. Images representative of 5 mice.

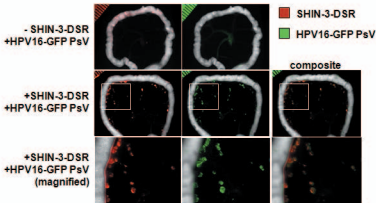


Figure S4. Animals (+/- SHIN-3 DSR tumors) received an intraperitoneal injection of HPV16-GFP PsV. HPV-16 GFP PsV (5×10^9 IU) was administered IP 14 days after tumor implantation. Three days post-injection, the small intestines was removed and placed in a "wheel" formation for *ex vivo* fluorescent imaging. White, Red (tumor, RFP), and Green (PsV infection, GFP) channels were collected and individual as well as merged images are pictured. Images representative of 3 mice.

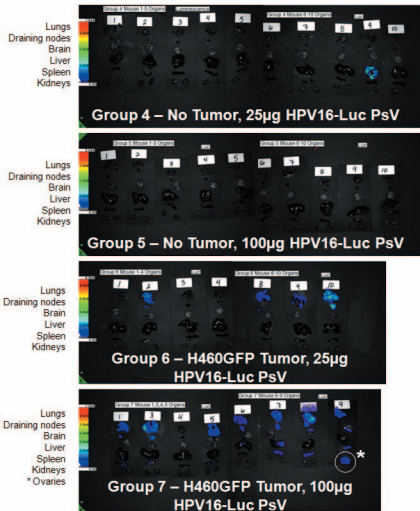


Figure S5. Animals (+/- H460-GFP tumors) received an intravenous injection of HPV16-Luc PsV. Two days post-injection, luciferin substrate was administered and after whole body bioluminescent imaging, organs were removed and imaged *ex vivo* prior to freezing.

Table S1 – HPV-16 infects many human tumor cell lines

Lung	Relative Infection	Melanoma	Relative Infection	Renal	Relative Infection
NCI-H522	4.6481	SK-MEL-2	1.0787	TK-10	0.2796
NCI-H23	1.2319	UACC-62	0.2508	CAKI-1	0.1325
NCI-H322M	1.0356	SK-MEL-5	0.1411	A498	0.0695
NCI-H460	0.8160	MALME-3M	0.0766	786-0	0.0143
EKVX	0.6172	LOXIMVI	0.0459	SN12C	0.0125
A549	0.2561	UACC-257	0.0017	ACHN	0.0119
HOP-62	0.0722	M14	0.0008	UO-31	0.0046
HOP-92	0.0301	SK-MEL-28	0.0003	RXF-393	0.0010
NCI-H226	0.0179				
Colon		Ovarian		CNS	
HCC-2998	1.4598	OVCAR-3	5.1347	SNB-19	0.3125
HCT-15	0.4791	OVCAR-4	1.3184	U251	0.1133
KM12	0.3486	IGROV1	0.4313	SF-268	0.0532
COLO205	0.2483	OVCAR-8	0.1012	SF-539	0.0203
HCT-116	0.1896	OVCAR-5	0.0933	SNB-75	0.0199
HT29	0.1335	SK-OV-3	0.0644	SF-295	0.0030
SW-620	0.0388				
Prostate		Lymphoid		Breast	
		K-562	0.7831	T47D	0.8488
PC-3	0.1782	RPMI 8226	0.0399	MCF7	0.6100
DU-145	0.1631	CCRF-CEM	0.0234	HS578T	0.0208
		MOLT-4	0.0004	BT-549	0.0178
		HL-60	0.0003	MDA-MB-231	0.0002

Table S1. HPV16-GFP PsV infects many human tumor cell lines. A panel of 56 human tumor cell lines were treated with HPV16-GFP PsV, and GFP signal was measured 72hr later. Data are average of duplicate wells, values from uninfected cells are subtracted. HeLa cells served as controls and were used to calculate the relative infection of each cell type.