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# Recombinant lipoprotein-based immunotherapy against human papillomavirus-associated cancer

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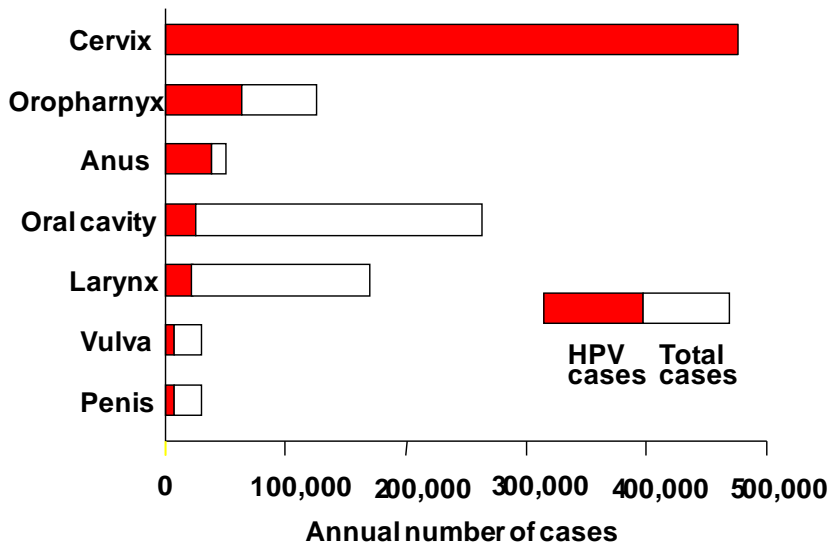
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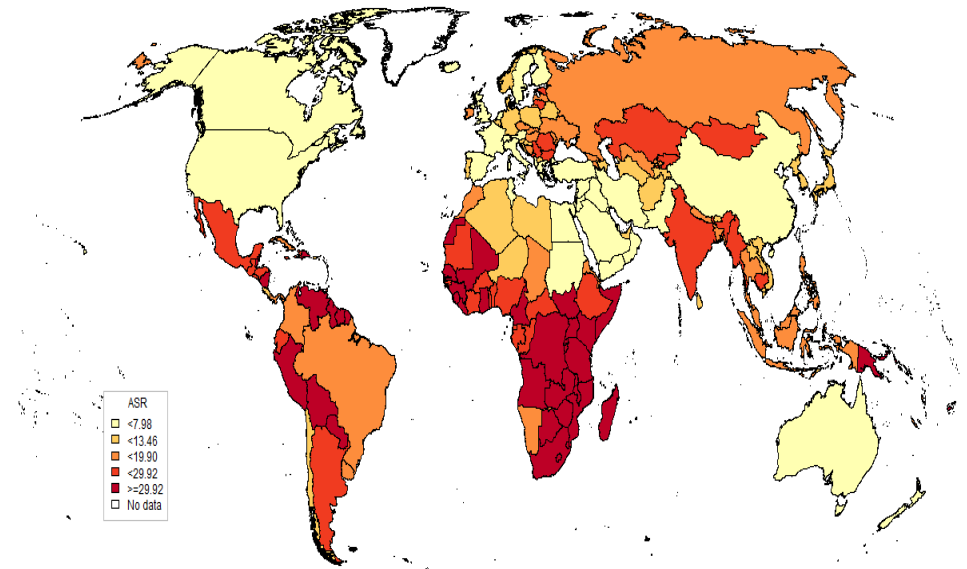


# Incidence of HPV associated cancer

HPV-associated cancer cancer



Cervical cancer

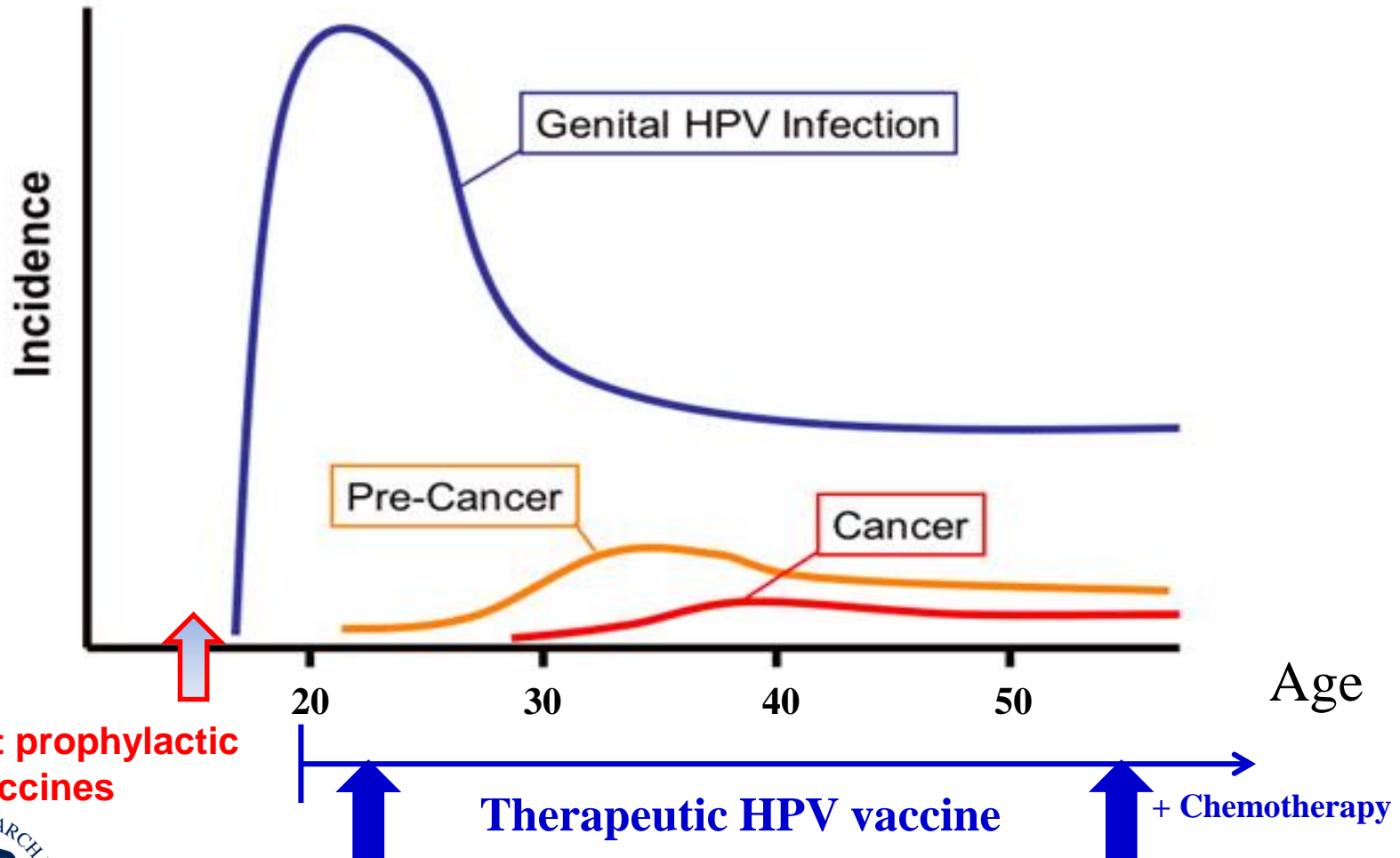


Current prophylactic HPV vaccines: Gardasil®, Cervarix®, Gardasil-9®

Coverage rate of prophylactic HPV vaccine is still low



# Therapeutic HPV vaccine may prevent the progress of HPV infection to cancer development



Current prophylactic HPV vaccines

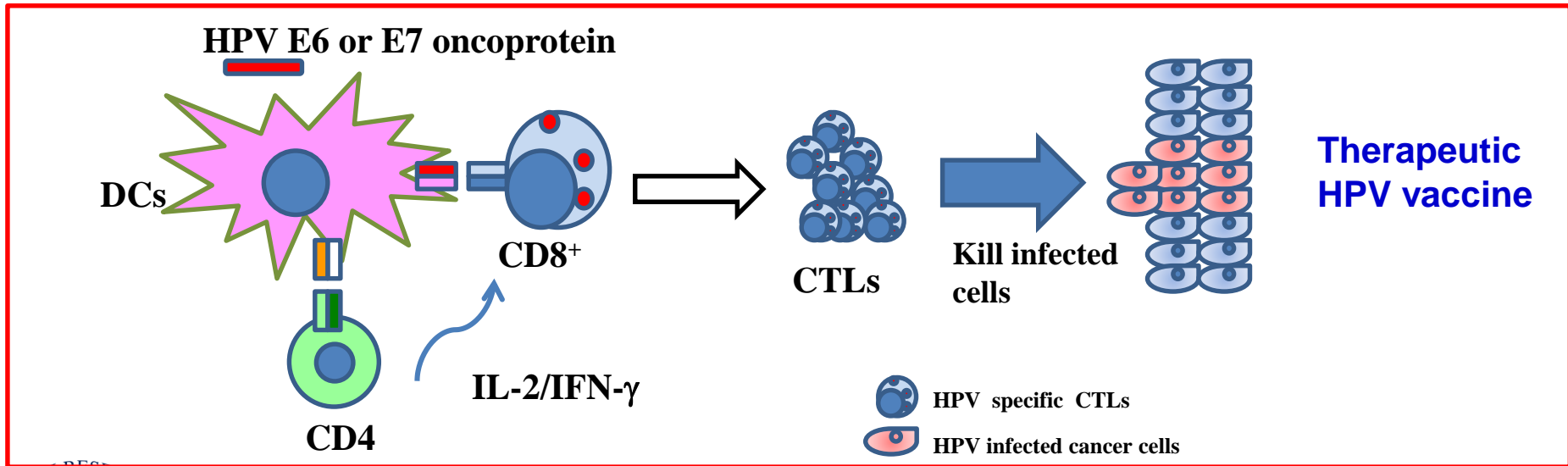
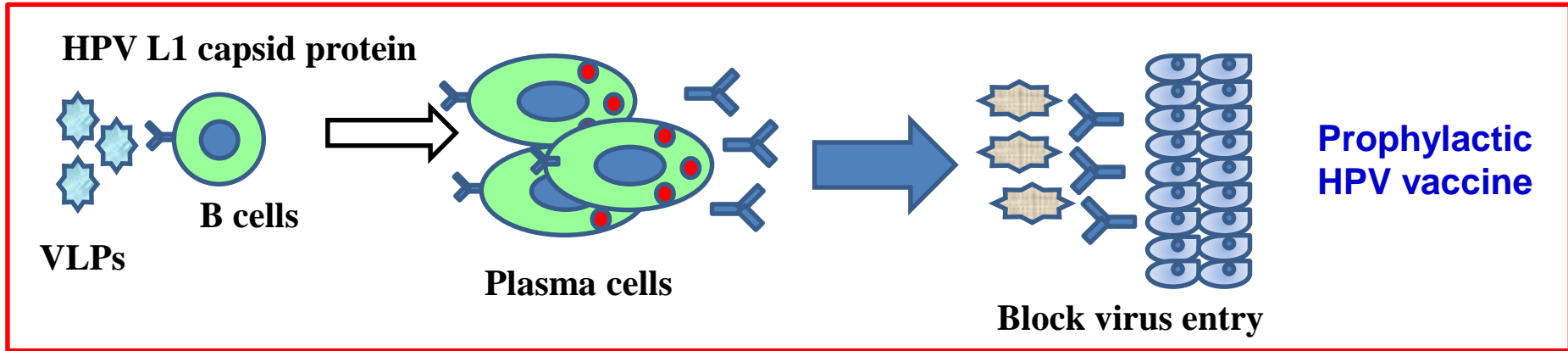
Therapeutic HPV vaccine

+ Chemotherapy



Lowy DR and Schiller TJ, J. Clin. Invest. 2006

# Protective mechanisms of prophylactic and therapeutic HPV vaccines



# Approaches of therapeutic HPV vaccine

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- DNA Vaccines
- Viral vectors or bacterial vectors
- Dendritic cell-based vaccines
- **Subunit vaccines** (high safety profile)
  - Long peptide containing CTL epitopes
  - Whole protein

Peptide/protein-based (Low immunogenicity)

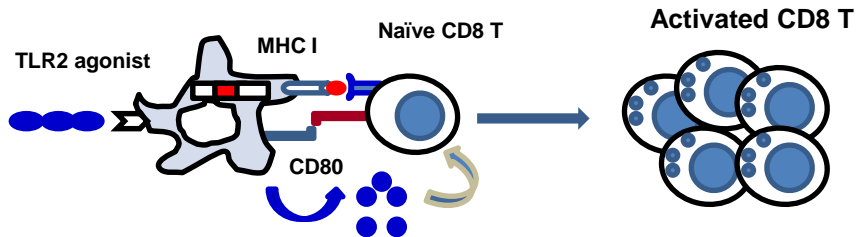


*Adjuvants are necessary*

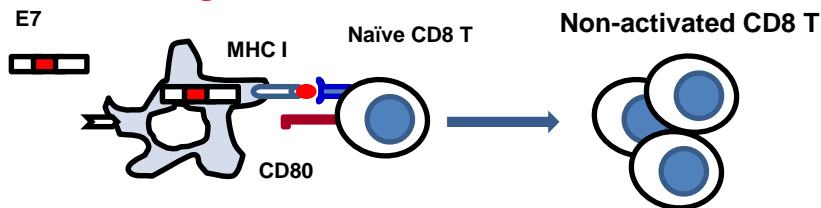
# Co-delivery of immunostimulatory adjuvant and antigen

## Antigen mixed with adjuvant

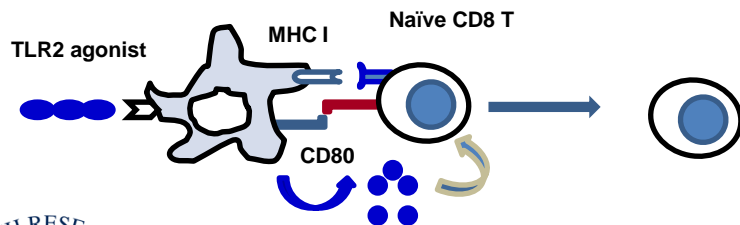
### Antigen and adjuvant in the same APCs



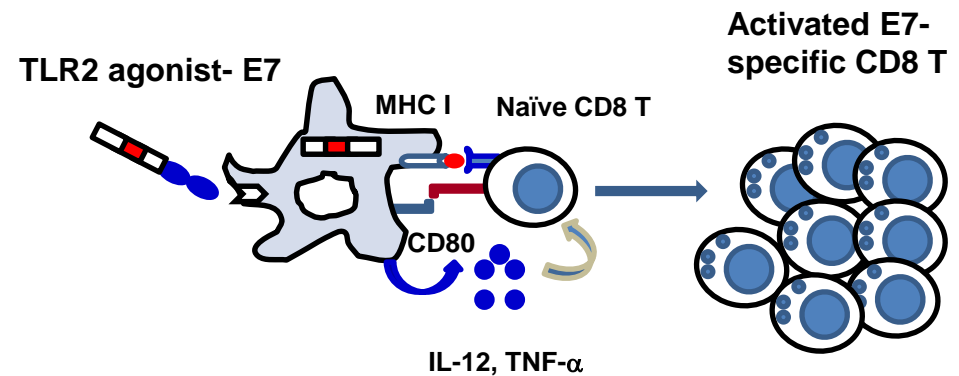
### Antigen alone



### Adjuvant alone

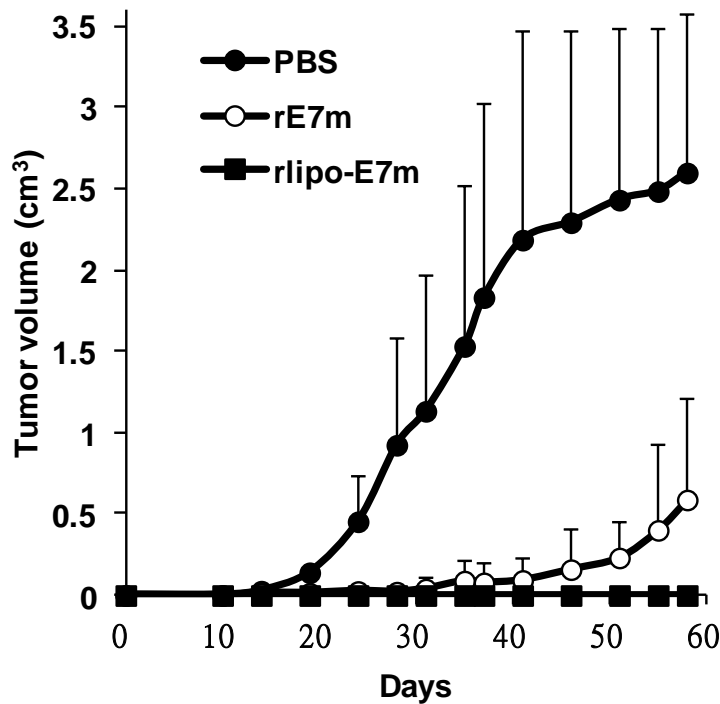
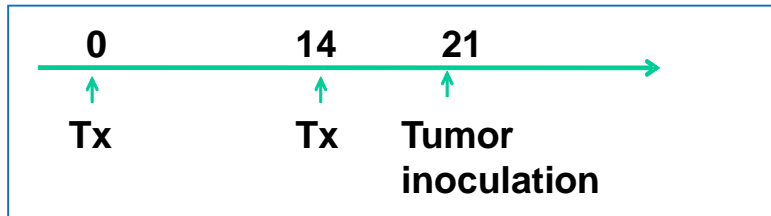


## Co-delivery of adjuvant and antigen

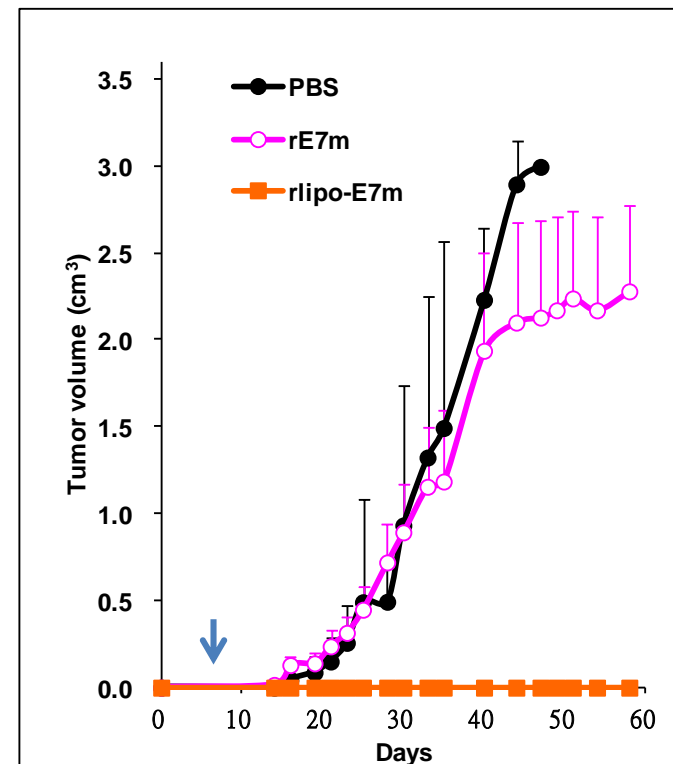
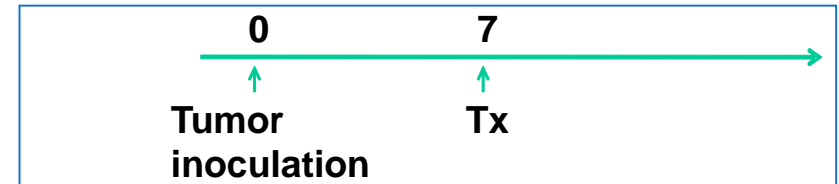


# Anti-tumor effects of rIipo-E7m in two model

## Prevent tumor growth



## Tumor regression

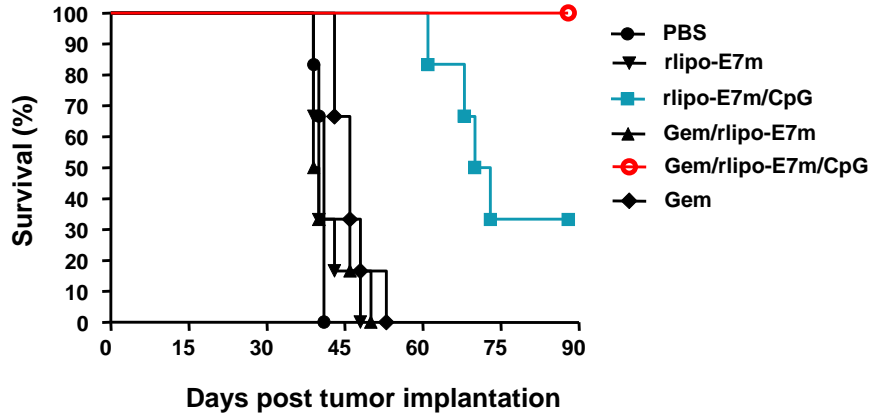


Tumor: TC-1 (HPV E7-expressed cells)

Huang et al. PLoS ONE, 2012

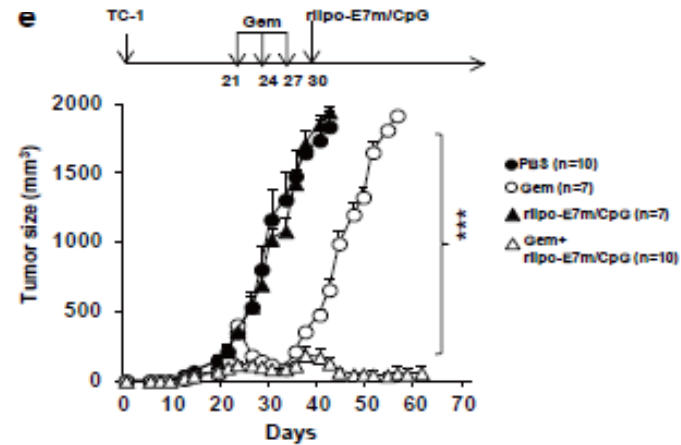
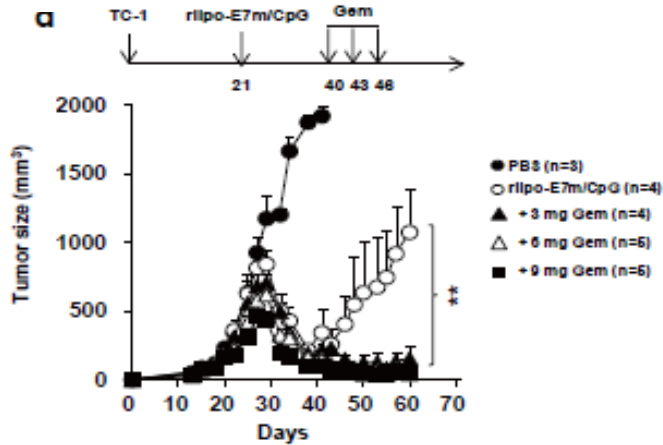
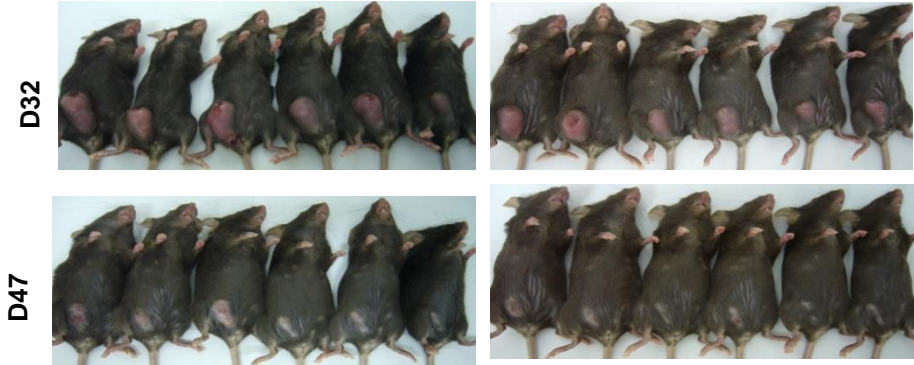
# Combination of chemotherapy inhibited large tumor growth

D24: gemcitabine i.p.  
D25: rliipo-E7m/CpG



rliipo-E7m/CpG

rliipo-E7m/CpG/Gem





# Summary

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1. The therapeutic HPV vaccine (rlipo-E7m) could be used to treat HPV-associated cancer that includes cervical cancer and oropharynx cancer.
2. Combination of chemotherapy dramatically increase anti-tumor effects of rlipo-E7m/CpG.
3. The therapeutic HPV vaccine is safe, efficient and low cost.