HPV
Herpes Zoster
Rotavirus
H5N1 Influenza ?
HIV ?
Others ?

J. A. Sands, 26 November 2007, Lehigh University
Successful 20th century vaccination campaigns

Diphtheria

Polio

Measles

Figure 1-31 The Immune System, 2/e (© Garland Science 2005)
Summary of the Adaptive Immune Response
("in 80 words or less")

Initial antigen presentation by "Antigen Presenting Cells" leads to the activation and proliferation of $T_H$ cells, which are required for the generation of the humoral response (clonally-selected $B$ cells secreting antigen-specific antibody that binds to extracellular virus particles) and the cell-mediated response (clonally-selected $T_C$ cells recognizing antigen-displaying "altered self" (i.e., infected) cells and killing them). A subset of these $B$ and $T_C$ cell populations become antigen-specific "memory" cells to provide long-lived immunity to re-infection.
Abnormal Pap Smear caused by Human Papillomavirus Infection
Papillomavirus life cycle

Progression from a benign cervical lesion to invasive cervical cancer

Relationship among incidences of cervical HPV infection, precancer, and cancer

The L1 Major Capsid Protein of Human Papillomavirus Type 11 Recombinant Virus-like Particles Interacts with Heparin and Cell-surface Glycosaminoglycans on Human Keratinocytes


From the Department of Virus and Cell Biology, Merck Research Laboratories, West Point, Pennsylvania 19486, the ¶ Department of Bioprocess and Bioanalytical Research, Merck Research Laboratories, Rahway, New Jersey 07065, and the Department of Biological Sciences, Lehigh University, Bethlehem, Pennsylvania 18015

Journal of Biological Chemistry,
Vol. 274, Issue 9, 5810-5822, 1999
Electron micrograph of HPV16 L1 VLPs

Proof-of-principle HPV VLP prophylactic efficacy trials

### Table 1
Proof-of-principle HPV VLP prophylactic efficacy trials

<table>
<thead>
<tr>
<th>Study</th>
<th>Koutsy et al. (32)</th>
<th>Harper et al. (35)</th>
<th>Villa et al. (33)</th>
<th>Mao et al. (34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPV VLP type</td>
<td>16</td>
<td>16, 18</td>
<td>6, 11, 16, 18</td>
<td>16</td>
</tr>
<tr>
<td>Adjuvant</td>
<td>Alum</td>
<td>AS04</td>
<td>Alum</td>
<td>Alum</td>
</tr>
<tr>
<td>Sponsor</td>
<td>Merck</td>
<td>GSK</td>
<td>Merck</td>
<td>Merck</td>
</tr>
<tr>
<td>Trial site</td>
<td>United States</td>
<td>United States,</td>
<td>United States,</td>
<td>United States</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Canada, Brazil</td>
<td>European Union,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Brazil</td>
<td></td>
</tr>
<tr>
<td>Subject age</td>
<td>16–23</td>
<td>15–25</td>
<td>16–23</td>
<td>16–23</td>
</tr>
<tr>
<td>No. subjects (ATP)</td>
<td>1,533</td>
<td>721</td>
<td>468</td>
<td>1,505</td>
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<tr>
<td>Vaccination schedule (mo)</td>
<td>0, 2, 6</td>
<td>0, 1, 6</td>
<td>0, 2, 6</td>
<td>0, 2, 6</td>
</tr>
<tr>
<td>Follow-up (yr)</td>
<td>1.5</td>
<td>1.5</td>
<td>2.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Persistent infections(^A)</td>
<td>42/0 (100)</td>
<td>7/0 (100)</td>
<td>36/4(^B) (90)</td>
<td>111/7(^C) (94)</td>
</tr>
<tr>
<td>CIN1+(^D)</td>
<td>9/0 (100)</td>
<td>6/0 (100)</td>
<td>3/0 (100)</td>
<td>24/0 (100)</td>
</tr>
</tbody>
</table>

*Shown are according-to-protocol (ATP) analyses for the HPV types included in the vaccines. \(^A\)Values are shown as number of controls versus number of vaccinees with persistent infections; values in parentheses indicate percent efficacy. \(^B\)Ten of 36 controls and 3 of 4 vaccinees were HPV DNA positive only at the last visit. \(^C\)Nineteen of 111 controls and 7 of 7 vaccinees were HPV DNA positive only at the last visit. \(^D\)Values are shown as number of controls versus number of vaccinees that were CIN1+; values in parentheses indicate percent efficacy. GSK, GlaxoSmithKline.*

Shingles – Herpes Zoster
Zostavax vaccine

• http://www.fda.gov/bbs/topics/NEWS/2006/NEW01378.html

• http://www.zostavax.com/
Rotavirus disease and vaccine

• http://www.rotavirusvaccine.org/
H5N1 Influenza vaccine?

- http://www.pandemicflu.gov/vaccine/vacres earch.html
HIV vaccine?

- HIV Vaccine Trials Network

- HIV/AIDS Vaccines page at National Institute of Allergy and Infectious Diseases (NIAID)
Summary

21’st Century Vaccines Against Viruses

- HPV
- Herpes Zoster
- Rotavirus
- H5N1 Influenza?
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- Others?

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