

Control of Virus Infections

Reading: Schaechter's Mechanisms of Microbial Disease, Fourth Edition, Chapters 44 & 45; Chapter 57 (pp. 548-550).

I. **Overview.** By virtue of their intracellular site of replication and the fact that viruses utilize many components of cellular transcription, replication and translation machinery, there are fewer anti-viral drugs available than there are antibiotics for bacterial infections. Control of viral infections has therefore relied more heavily on blocking dissemination using physical control measures, or by using vaccines to set up a protective immune response.

II. Preventive measures

- A. Quarantine
- B. Hygiene
- C. Vector control
- D. Changes in lifestyle
- E. Vaccines

III. Control Measures

- A. Vaccines
 - 1. "Active vaccines" where virus or modified forms of virus used. 3 major types
 - a. Attenuated (live) viruses
 - b. Inactivated (killed) viruses
 - c. Purified individual viral components
 - d. DNA-based vaccines
 - 2. "Passive vaccines" - products of the immune system
 - a. Mothers milk
 - b. Immune globulin
 - c. Adoptive transfer (T-cells)
- B. Antiviral drugs
 - 1. Targets include receptors, enzymes associated with replication, protease inhibitors
 - 2. Newer strategies involved anti-sense oligonucleotides
 - 3. The problem of drug resistance

Bioterrorism

I. Smallpox (Variola Virus)

- A. The disease - very important to distinguish the smallpox rash from that of chickenpox.
- B. Features of the disease which facilitated eradication
smallpox compared to measles and polio -the next WHO targets
- C. Post-September 11 smallpox ACIP vaccination recommendations -
<http://www.bt.cdc.gov/agent/smallpox/index.asp>
- D. Smallpox vaccination and immunocompromised patients - the balance between potency and complications

II. A modeled smallpox bioterrorism attack - will it be that bad?

- A. <http://www.cdc.gov/ncidod/EID/vol5no4/otoole.htm>
- B. In the model, 5 index cases lead to 15,000 total cases and 2000 deaths
- C. Can variola be engineered to overcome the effects of vaccination?
 1. Ectromelia and IL-4
 2. See seminal paper by Jackson, Ramshaw et. al. (J.Virol.75, 12-5-1210, 2001).

III. Monkeypox virus

- A. Symptoms and disease indistinguishable from smallpox
- B. Classified by CDC as an emerging disease.
- C. Cohen, J. Is an old virus up to new tricks? Science. 1997, July 18; 277, 312-313.
- D. From the Centers for Disease Control and Prevention. Human monkeypox-Kasai Oriental, Democratic republic of Congo, February 1996-October 1977. JAMA. 1998, 279, 189-190
- E. Reports of Human to human transmission
<http://wonder.cdc.gov/wonder/prevguid/m0048673/m0048673.asp>