

AIDS: Evolution of an Epidemic
2007 Holiday Lectures on Science
Chapter List

Lecture One

From Outbreak to Epidemic

Bisola O. Ojikutu, M.D., M.P.H.

1. Start of Lecture 1
2. Welcome by HHMI President Dr. Thomas Cech
3. Profile of Dr. Bisola Ojikutu
4. 1980 and the first signs of the coming epidemic
5. Pneumocystis pneumonia (PCP) found in affected patients
6. PCP outbreaks and the CDC
7. Video: First AIDS patients
8. Similar infections in the first set of patients
9. Opportunistic infection: Cytomegalovirus
10. Opportunistic infection: Candidiasis
11. Opportunistic infection: Kaposi's sarcoma
12. Opportunistic infection: Herpesvirus
13. AIDS defined
14. Cells of the immune system
15. Antigen-presenting cells and helper T cells
16. Early epidemic signs in the U.S.
17. Tracing individuals to determine the spread of the epidemic
18. More pieces of the AIDS puzzle
19. Q&A: Is Kaposi's sarcoma a deadly cancer?
20. Q&A: Are opportunistic infections worse in AIDS patients?
21. AIDS timeline
22. Animation: U.S. AIDS epidemic
23. Early groups affected by AIDS
24. Early theories on what caused AIDS
25. Gallo and Montagnier discover the AIDS virus
26. Demo: Rapid AIDS virus test
27. Isolating the AIDS virus from lymph cells
28. HIV: The retrovirus that causes AIDS
29. Antibodies to HIV found in infected people
30. Development of an antibody-based test for HIV
31. How the ELISA test works
32. Detecting HIV samples preserved before the outbreak
33. HIV infection precedes AIDS symptoms by years
34. Modes of HIV transmission
35. U.S. AIDS infection estimates from mid-1980s
36. Global HIV/AIDS estimates
37. Q&A: What happens after an HIV-positive test result?
38. Q&A: How did the infection get so widespread?
39. Q&A: What is the time from HIV infection to developing AIDS?
40. Q&A: Does the HIV test detect HIV throughout infection?

41. Q&A: How was HIV transmitted in Haitian cases?
42. Q&A: Are opportunistic infections getting worse over time?
43. Results of rapid HIV test
44. Zinhle Thabethe and her HIV-positive status
45. Closing remarks by HHMI President Dr. Thomas Cech

Lecture Two

AIDS and the HIV Life Cycle

Bruce D. Walker, M.D.

1. Start of Lecture 2
2. Introduction by HHMI Vice President Dr. Peter Bruns
3. Profile of Dr. Bruce Walker
4. Introductory remarks by Dr. Walker
5. How viruses cause disease
6. Persistent viral infections have an acute initial infection phase
7. Video: Symptoms of acute HIV infection
8. Symptoms of HIV acute viral infection
9. Why HIV tests show no infection during acute phase
10. Development of an antibody response
11. Measuring HIV RNA detects high HIV levels during acute infection
12. HIV RNA can be detected before antibodies to HIV
13. Does HIV infection progress the same way in all people?
14. HIV viral load as a predictor of disease progression
15. Viral load compared to helper T cell level
16. Animation: HIV life cycle (part 1)
17. Helper T cells orchestrate the immune response
18. Animation: HIV life cycle (part 2)
19. Summary
20. Q&A: What can be done after accidental HIV exposure?
21. Q&A: What conditions can HIV survive in?
22. Q&A: If the virus integrates, how does T cell count decline?
23. Is the immune system trying to keep HIV in check?
24. Humoral immunity and antigen binding
25. Antibodies neutralize HIV by binding to its surface proteins
26. Can neutralizing antibodies prevent initial infection?
27. Mechanism of cytotoxic T lymphocytes (CTLs)
28. Animation: Antigen presentation and CTL
29. Video: CTL killing a target cell
30. Do CTLs help limit HIV infection?
31. How helper T cells orchestrate an immune response
32. By eliminating helper T cells, HIV disables the immune response
33. Summary
34. Q&A: What causes a person to have a high or low viral load?
35. Q&A: Do mutations cause changes in the HIV envelope proteins?
36. Q&A: Do some people not have the receptors that HIV uses?
37. Q&A: Why can't we use antibodies to HIV as a vaccine?
38. Q&A: Could you make drugs to attack HIV's protease or integrase?
39. Closing remarks by HHMI Vice President Dr. Peter Bruns

Lecture Three

Drugs and HIV Evolution

Bisola O. Ojikutu, M.D., M.P.H.

1. Start of Lecture 3
2. Welcome by HHMI Program Director Dr. Dennis Liu
3. Dr. Bisola Ojikutu in South Africa
4. Antiretroviral therapy can halt progression to AIDS
5. Video: Benefits of antiretroviral therapy
6. AZT: The first antiretroviral used to fight HIV
7. AZT's mechanism of action
8. Animation: AZT blocks reverse transcriptase
9. Drug development and approval process
10. AZT's initial clinical results were encouraging
11. HIV evolves to become resistant to a drug
12. Treating with multiple drugs to battle resistance
13. Animation: Protease inhibitor
14. Triple-drug therapy sustains low viral levels
15. Triple-drug therapy and drop in U.S. AIDS deaths
16. Problems with triple-drug therapies and a search for new drugs
17. Video: Steve Crohn: HIV free despite exposure
18. People who have mutant CCR5 coreceptors avoid infection
19. New class of drugs that inhibits CCR5
20. Q&A: Is the CCR5 inhibitor drug working well?
21. Q&A: Does AZT also affect cellular replication?
22. Q&A: Do age groups differ in HIV drug resistance?
23. Q&A: How common is the CCR5 mutation?
24. Q&A: Do the drugs have side effects?
25. Q&A: do CCR5 mutations have an effect on people
26. Q&A: Is caution needed with ART due to HIV mutations?
27. Q&A: Can you take CCR5 inhibitor without other drugs?
28. Q&A: Can using different classes of drugs lower mutation rate?
29. Video: Adhering to an antiretroviral regimen
30. Why adherence to HIV medications is crucial
31. Relationship of adherence to virologic failure
32. Demo: Student adherence activity
33. Demo: Student adherence results
34. Demo: Students discuss their adherence issues
35. HIV prevalence growing in certain U.S. populations
36. Statistics on the global HIV/AIDS epidemic
37. South African HIV/AIDS statistics
38. Barriers to treatment in South Africa
39. AIDS orphans and the "gogo"
40. Umndeni "Family" Care Program
41. Mother-to-child HIV transmission is preventable
42. Q&A: How long does a newborn have to take ARVs?
43. Q&A: Does a C-section remove the need for perinatal ARVs?
44. Q&A: Can helper T cells be artificially enhanced?
45. Q&A: Can CCR5 inhibitors prevent initial infection?

46. Q&A: Can CCR5 inhibitors be made into a vaccine?
47. Q&A: Why were the initial U.S. cases in homosexual men?
48. Q&A: What are governmental barriers to treatment?
49. Q&A: What preventive measures do health-care workers take?
50. Q&A: Is there hesitation in being tested?
51. Q&A: What has U.N. done about mother-to-child transmission?
52. Q&A: How does a child avoid infection from the mother?
53. Q&A: Why are more women being infected in the U.S.?
54. Closing remarks by HHMI Program Director Dr. Dennis Liu

Lecture Four

Vaccines and HIV Evolution

Bruce D. Walker, M.D.

1. Start of Lecture 4
2. Welcome by HHMI President Dr. Thomas Cech
3. Dr. Bruce Walker in South Africa
4. HIV drugs have revolutionized treatment
5. Hopes for an HIV vaccine have existed for years
6. How vaccines work
7. Antibody-inducing vaccines provide immunity
8. Ways of creating a vaccine
9. Vaccination primes the immune system for future exposure
10. Past successes with vaccination
11. Video: HIV's origin in Africa
12. How HIV was first transmitted to humans
13. HIV mutation leads to staggering diversity in HIV genome
14. Subtype variation complicates finding a universal vaccine
15. HIV mutation means antibodies are always a step behind
16. Problems with targeting HIV's envelope proteins
17. Is using cytotoxic T lymphocytes (CTLs) an option?
18. HIV variability disrupts antigen presentation to CTLs
19. Additional reasons for failure of CTLs to respond
20. CTLs can be induced to work by functioning helper T cells
21. Summary
22. Q&A: If HIV is changing, how can it still attach to receptors?
23. Q&A: Why are there locations that have more HIV variation?
24. Vaccines to reduce viral load could reduce the epidemic
25. Disappointing results in the first HIV vaccine tests
26. Possible reason for failure of the HIV vaccine
27. Studying vaccine targets in Durban, South Africa
28. Building research facilities in South Africa
29. A responsibility to treat research subjects
30. Antibody response and relationship to viral load
31. Can HIV infection be controlled?
32. Video: Bob Massie: Infected but AIDS free
33. Massie's immune system controls the infection properly
34. Significance of elite controllers
35. Scanning genomes to find a genetic basis for elite controllers
36. Genome scanning and big dogs vs. little dogs
37. Using genome scans on elite controllers
38. Summary
39. Tuberculosis and AIDS
40. Q&A: Could CCR5 drugs be given to noninfected people?
41. Q&A: Is HIV infection similar to being a TB carrier?
42. Dr. Thomas Cech announces speakers for next Holiday Lectures