Watch Movie: Meningitis
Answer the movie questions on the worksheet.

Complete activities 1-3.

Activity #1:
• Go to the patho web page and click on activity 1.
• Click on “Tutorials”
• Click on “Immunopathology”
• Use the tutorial and your class materials to answer questions 1-17 on the accompanying worksheet.

Activity #2:
• Click on activity 2.
• Complete case studies 1-3 on the accompanying worksheet.

Activity #3:
• Go to the patho web page and click on activity 4.
• Click on “microbiology” in the left-hand frame.
• Review the tutorials (Bacteriophage, Dividing Bacteria, Bacterial Motility, Penicillin, Helicobacter pylori, Streptococcus, and Parasites) and take the quiz on microbes.
• To return to the tutorial menu after each section, click on “immunology” again.
1. What is meningitis?

2. List 3 types of bacteria that cause meningitis.

3. How is meningococcal meningitis spread?

4. People that have been infected with meningococcal meningitis are contagious ____________ before symptoms to ____________ after beginning curative treatment.

5. The meningococcal bacteria penetrate the ____________________________ and then reach the _____________________________.

6. ________________ produced by the bacteria poison nerve cells thus causing pus formation and swelling.

7. Pressure building in the skull can lead to ________________
__________, and ________________.

8. Meningococcemia is a meningococcal infection of the ________________
which can lead to _______________________ throughout the body.


10. Which form of meningitis is less serious?

11. List the most common causative bacterial agent for meningitis in the following age groups:

http://chpweb.weber.edu/hthsci/labpages/
a. Children under 5.
b. Persons age 5-50.
c. Adults over age 50.

12. Symptoms of meningitis include:

13. What procedure is used to obtain cerebral spinal fluid used for diagnosing meningitis?

14. What is the prognosis for a meningitis patient that receives early treatment?

15. Meningitis in children has decreased significantly because of what preventative measure?
Activity 1

1. What cells mediate humoral immunity? Cellular?

2. What region of the immunoglobulin provides for antigenic specificity?

3. What is another name for CD4 cells? What are their primary functions?

4. What is another name for CD8 cells? What are their primary functions?

5. HLA antigens are located on what type of cell?

6. List 2 reasons that HLA antigens are important.

7. Jane Smalley has been diagnosed with acute glomerulonephritis. What type of hypersensitivity reaction has she experienced? Briefly explain the mechanism behind this type of reaction.

8. Asthma is an example of a type ____ hypersensitivity reaction. Briefly explain the mechanism behind this type of reaction.

9. John Smith is suffering from a rash covering his body. He tells the ER Doc that he went hiking earlier in the day and may have encountered poison ivy. John's reaction is an example of a type ________ hypersensitivity reaction or _________hypersensitivity. Briefly explain the mechanism behind this type of reaction.
9. List 3 diseases or conditions that demonstrate a type II hypersensitivity reaction. Briefly explain the mechanism behind this reaction.

10. Matching. Use the tutorial and your class materials to match the following terms.

1. ______Multiple Sclerosis  A. Slow progressive organ failure
2. ______Hyperacute graft rejection  B. Breakdown of tolerance
3. ______Alloimmunity  C. Graft rejection by preexisting antibodies (Abs)
4. ______Chronic graft rejection  D. Autoimmune Abs against the myelin sheath
5. ______SLE  E. Cell-mediated graft reaction
6. ______Acute graft rejection  F. Reaction against antigens (Ag's) from same species
7. ______Autoimmunity  G. Positive ANA

12. An immunodeficiency caused by lack of a thymus

13. A patient with this secondary immunodeficiency would show decreased numbers of CD4 cells.

14. The inheritance pattern of Wiskott-Aldrich syndrome
15. An immunodeficiency that develops after birth

16. Lack of mature B cells

17. Causes more severe allergen responses
Use the tutorial and your class materials to answer the following case studies.

1. **See slide 1.**
   This patient is a 16 year-old girl who tells the physician that she was feeling well until about six months ago. At that time she noticed increasing fatigue and her ankles periodically swelled up. Her local physician did a routine physical examination and noted 2+ pitting edema of her ankles, a “butterfly” rash on her face, but no other findings. A routine urinalysis showed 4+ proteinuria (protein in the urine) and red blood cells. An erythrocyte sedimentation rate (ESR) was elevated. Her antinuclear antibody (ANA) was positive at 1:256 (normal <1:20). What is your diagnosis?

2. A 27 year-old man was brought to the emergency room following an episode of minor trauma in which he sustained minor bruises to his left upper arm and chest in a fall off a ladder. Approximately one hour after admission, he suddenly became short of breath, gasping for air. Despite resuscitation, he died minutes later. The only major finding at autopsy was marked laryngeal edema, shown here. **See slide 2.** It was also noted that he had a right wrist band that said “allergy to penicillin”. What do you think happened?

3. A 49 year-old woman had a chronic cough for over a year. Recently, she noted that the sputum was streaked with blood. She also had fever, and had lost 20 lbs in the last 4 months. Chest x-ray revealed bilateral upper lobe nodular infiltrates along with a left upper lobe cavitation. A biopsy from the lung showed rod shaped bacteria with an acid fast stain (this stain is positive for organisms with cell walls consisting of a high lipid content making the organism very resistant to phagocytosis). **See slide 3a.** Granulomas were also noted on the biopsy. **See slide 3b.** What is your diagnosis? What type of inflammatory reaction is responsible for the granulomas?
ANSWERS TO MENINGITIS MOVIE WORKSHEET

1. What is meningitis? INFLAMMATION OF THE MENINGES.

2. List 3 types of bacteria that cause meningitis. HAEMOPHILUS INFLUENZAE TYPE B, PNEUMOCOCCUS, MENINGOCOCCUS.

3. How is meningococcal meningitis spread? SPREAD BY AIRWAYS BY NASAL DROPLETS IN THROAT SECRETIONS.

4. People that have been infected with meningococcal meningitis are contagious ______________ before symptoms to ______________ after beginning curative treatment. . 1 WEEK, 24 HOURS

5. The meningococcal bacteria penetrate the __________________________ and then reach the __________________________. SMALL VESSELS OF THE LUNGS, CSF

6. ______________ produced by the bacteria poison nerve cells thus causing pus formation and swelling. TOXINS

7. Pressure building in the skull can lead to ______________, ______________, and ______________. INHIBITION OF ALL BODY SYSTEMS, COMA, CARDIAC ARREST.

8. Meningococcemia is a meningococcal infection of the ______________, which can lead to ______________ throughout the body. BLOOD, SMALL EMBOLISMS

9. List 3 possible long term complications of meningitis. DEAFNESS, BLINDNESS, MENTAL DISABILITIES.

10. Which form of meningitis is less serious? VIRAL

11. List the most common causative bacterial agent for meningitis in the following age groups:

   a. Children under 5. HAEMOPHILUS INFLUENZAE TYPE B
   b. Persons age 5-50. MENINGOCOCCUS
   c. Adults over age 50. PNEUMOCOCCUS
12. Symptoms of meningitis include: SHIVERING, IRRITABILITY, FATIGUE, HEADACHE, STIFF NECK, PETECHIAE, VOMITING, CONFUSION, AND LETHARGY

13. What procedure is used to obtain cerebral spinal fluid used for diagnosing meningitis? LUMBAR PUNCTURE

14. What is the prognosis for a meningitis patient that receives early treatment? 90% RECOVERY RATE

15. Meningitis in children has decreased significantly because of what preventative measure? HIB VACCINATION
ANSWERS TO IMMUNOPATHOLOGY TUTORIAL WORKSHEET

1. What cells mediate humoral immunity?  Cellular?
   HUMORAL: B CELLS; CELLULAR: T CELLS

2. What region of the immunoglobulin provides for antigenic specificity?
   FAB VARIABLE REGIONS

3. What is another name for CD4 cells?  What are their primary functions?
   T HELPER CELLS.  STIMULATE B CELLS TO PROLIFERATE AND MAKE AB, STIMULATE THE PRODUCTION OF CYTOTOXIC T CELLS

4. What is another name for CD8 cells?  What are their primary functions?
   CYTOTOXIC T CELLS; DIRECTLY ATTACK FOREIGN CELLS.

5. HLA antigens are located on what types of cells?  NUCLEATED CELLS.

6. List 2 reasons that HLA antigens are important.  TISSUE MATCHING FOR TRANSPLANTATION; REGULATE SOME OF THE IMMUNE RESPONSE; CERTAIN HLA ANTIGENS ARE ASSOCIATED WITH A VARIETY OF DISEASES

7. Jane Smalley has been diagnosed with acute glomerulonephritis.  What type of hypersensitivity reaction has she experienced?  Briefly explain the mechanism behind this type of reaction.  TYPE III HYPERSENSITIVITY REACTION; TISSUE IS DAMAGED FROM THE ACTIVATION OF COMPLEMENT BY AG-AB COMPLEXES.  AB REACTS WITH SOLUBLE AG.  THE COMPLEXES PRECIPITATE AND DEPOSIT IN THE KIDNEY TUBULES.

8. Asthma is an example of a type ____ hypersensitivity reaction.  Briefly explain the mechanism behind this type of reaction.  TYPE I HYPERSENSITIVITY REACTION.  IGE THAT HAS PREVIOUSLY BOUND TO MAST CELLS CAUSES THE RELEASE OF MAST CELL GRANULES WHEN NATURALLY OCCURRING AG IS INHALED (I.E. ASTHMA, HAYFEVER) OR INGESTED (I.E. FOOD ALLERGIES).
9. John Smith is suffering from a rash covering his body. He tells the ER Doc that he went hiking earlier in the day and may have encountered poison ivy. John’s reaction is an example of a type _________ hypersensitivity reaction or _________ hypersensitivity. Briefly explain the mechanism behind this type of reaction. **TYPE IV HYPERSENSITIVITY REACTION OR DELAYED HYPERSENSITIVITY. SENSITIZED T CELLS RELEASE LYMPHOKINES WHICH INITIATE AN INFLAMMATORY RESPONSE**

10. List 3 diseases or conditions that demonstrate a type II hypersensitivity reaction. Briefly explain the mechanism behind this reaction. **TRANSFUSION REACTIONS, AUTOIMMUNE HEMOLYTIC ANEMIA, HEMOLYTIC DISEASE OF THE NEWBORN. ANTIBODY REACTS WITH AG ON CELLS. THE AB BOUND CELLS ARE PHAGOCYTIZED OR ACTIVATE COMPLEMENT WHICH CAUSES CELLULAR LYSIS.**

11. Matching. Use the tutorial and your class materials to match the following terms.

   1. ___D___Multiple Sclerosis                      A. Slow progressive organ failure
   2. ___C___Hyperacute graft rejection             B. Breakdown of tolerance
   3. ___F___Alloimmunity                           C. Graft rejection by preexisting Abs
   4. ___A___Chronic graft rejection                D. Autoimmune Abs against the myelin sheath
   5. ___G___SLE                                    E. Cell-mediated graft reaction
6. __E__ Acute graft rejection  F. Reaction against Ag’s from same species

7. __B__ Autoimmunity  G. Positive ANA

12. An immunodeficiency caused by lack of a thymus. **DI GEORGE SYNDROME**

13. A patient with this secondary immunodeficiency would show decreased numbers of CD4 cells. **AIDS**

14. The inheritance pattern of Wiskott-Aldrich Syndrome. **X-LINKED RECESSIVE**

15. An immunodeficiency that develops after birth. **SECONDARY IMMUNODEFICIENCY**

16. Lack of mature B cells. **BRUTON AGAMMAGLOBULINEMIA**

17. Causes more severe allergen responses. **SELECTIVE IGA DEFICIENCY**.

**Case Studies**

Use the tutorial and your class materials to answer the following case studies.

12. **See Slide 1**.

This patient is a 16-year-old girl who tells the physician that she was feeling well until about six months ago. At that time she noticed increasing fatigue and her ankles periodically swelled up. Her local physician did a routine physical examination and noted 2+ pitting edema of her ankles, a “butterfly” rash on her face, but no other findings. A routine urinalysis showed 4+ proteinuria (protein in the urine) and red blood cells. An erythrocyte sedimentation rate (ESR) was elevated. Her antinuclear antibody (ANA) was
13. A 27-year-old man was brought to the emergency room following an episode of minor trauma in which he sustained minor bruises to his left upper arm and chest in a fall off a ladder. Approximately one hour after admission, he became suddenly short of breath, gasping for air. Despite resuscitation, he died minutes later. The only major finding at autopsy was marked laryngeal edema, shown here. See Slide 2. It was also noted that he had a right wrist band that said "Allergy to penicillin". What do you think happened? THE PATIENT RECEIVED PENICILLIN BY MISTAKE WHICH CAUSED A TYPE I HYPERSENSITIVITY REACTION WITH SYSTEMIC ANAPHYLAXIS.

14. A 49-year-old woman had a chronic cough for over a year. Recently, she noted that the sputum was streaked with blood. She also had fever, and had lost 20 lbs in the last 4 months. Chest x-ray revealed bilateral upper lobe nodular infiltrates along with a left upper lobe cavitation. A biopsy from the lung showed rod shaped bacteria with an acid fast stain (this stain is positive for organisms with cell walls consisting of a high lipid content making the organism very resistant to phagocytosis). See slide 3a. Granulomas were also noted on the biopsy. See slide 3b. What is your diagnosis? What type of inflammatory reaction is responsible for the granulomas? TUBERCULOSIS; CHRONIC INFLAMMATORY RESPONSE.