

Pneumonia – Immunization and Vaccine

Name of disease

- Pneumonia is an infection that inflames the air sacs in one or both lungs. The air sacs may fill with fluid or pus (purulent material)
- 4 stages of pneumonia:
 - + Congestion: Start in the first 24 hours, in this stage, a person will experience coughing and deep breathing.
 - + Red Hepatization: During this stage, the alveoli will contain many erythrocytes, neutrophils, desquamated epithelial cells, and fibrin.
 - + Grey Hepatization : There will be a persistence of fibrin exudate during this stage.
 - + Resolution: The resolution, or complete recovery, occurs when the exudate experiences progressive enzymatic digestion. This will produce debris that is eventually reabsorbed, ingested by macrophages, coughed up, or reorganized by fibroblasts.
- *Children under 2 and adults above 65 are having a high risk of causing pneumonia. People who have a weakened immune system also have a high chance causing pneumonia.

History of the Disease

- Described at early 400BC
- In 1918, Pneumonia killed 50-100 million people in Spanish flu.
- Streptococcus pneumoniae and Klebsiella pneumoniae were discovered in 1882 and 1884 by Carl Friedländer and Albert Fraenkel
- Viral pneumonia was described by Hobart Reimann in 1938

Symptoms of the disease

- Cough
- Fever, sweating
- Shortness of breath
- Rapid, shallow breathing
- Loss of appetite
- *Difference between Pneumonia and COVID_19
- For Pneumonia, one part of the lung gets infection while COVID_19, the patients' lungs are actually all get inflammation which means it infects all over the lung . People who have pneumonia have a high risk of causing COVID_19

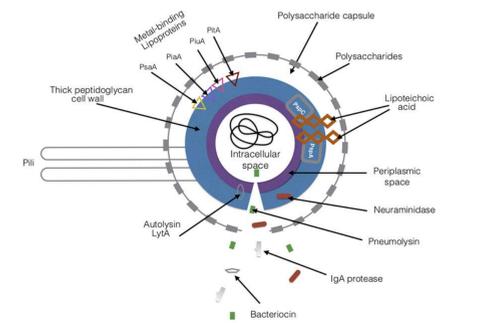


Figure 1. Structure of Streptococcus pneumoniae

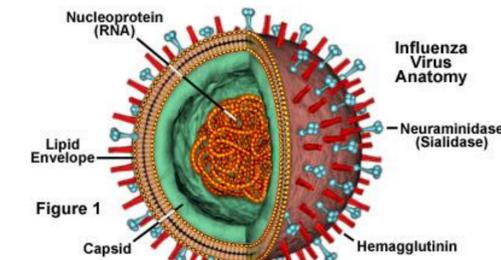


Figure 2. Structure of the Influenza virus

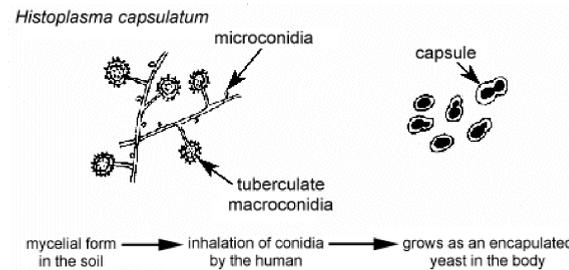


Figure 3. Structure of the Histoplasma capsulatum

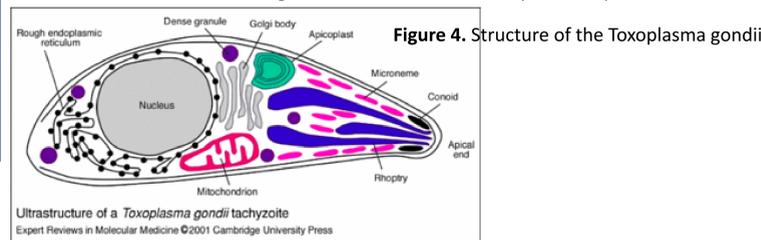


Figure 4. Structure of the Toxoplasma gondii

Structure of the virus/bacteria

- Figure 1: Structure of the Streptococcus pneumoniae (bacterial pneumonia) .
- Figure 2: Structure of the Influenza virus(viral pneumonia)
- Figure 3: Structure of the Histoplasma capsulatum (fungal pneumonia)
- Figure 4: Structure of the Toxoplasma gondii (Parasitic pneumonia)

What cause pneumonia

- The most common cause of pneumonia is bacterial infection, It is possible that after a viral infection of the upper respiratory tract, the virus now damages the lining of the respiratory airways, making it easier for bacteria to enter and attack the lungs.
- Pneumonia caused by virus, bacteria and also fungi, some cases caused by parasites but they are rare.
- Bacterial pneumonia
 - + Streptococcus pneumoniae contributes 50% of cases (alcoholism is associated)
 - + Haemophilus influenzae 13%
 - + Mycoplasma pneumoniae 3%
 - + Staphylococcus aureus
 - + Moraxella catarrhalis
 - + Legionella pneumophila
- Common Viral pneumonia:
 - + Human parainfluenza viruses (in children)
 - + Influenza virus A and B
 - + Respiratory syncytial virus
 - + Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
- Rarer viruses that cause pneumonia:
 - + Adenovirus
 - + Metapneumovirus
 - +SARS-CoV
 - + MERS-CoV
 - + Hantaviruses
- Fungal pneumonia (uncommon but occurs with weakened immune systems due to AIDS). Some common fungi:
 - + Histoplasma capsulatum
 - + Blastomyces
 - + Cryptococcus neoformans
 - + Pneumocystis pneumonia
- Parasitic pneumonia:
 - + Toxoplasma gondii
 - + Strongyloides stercoralis
 - + Ascaris lumbricoides
 - + Plasmodium malariae

Transmission of the disease

- Inhaling the infection
- Through the mouth or eyes
- When the germs from this person who has pneumonia spread to another person (coughs, sneezes)
- Prevention:
 - Wash hand frequently
 - Get a flu-shot
 - Quit smoking
 - Stay home when ill
- *Treated:
 - Get flu shot
 - Do not take cough medicine, ask the doctors
 - Control your fever with aspirin (*Do not give aspirin to children)
 - Drink warm beverages, use humidifier to ease breathing
 - Stay away from smoke
 - See the doctor if it get worse instead of getting better.
- *For viral pneumonia, antibiotics cannot cure, oseltamivir (Tamiflu), zanamivir (Relenza), or peramivir (Rapivab) may be prescribed by the doctor

*Fungal pneumonia are treated antifungal drugs and sometimes by surgical debridement.
*Parasitic pneumonia are cured with praziquantel (Biltricide) and triclabendazole (Egaten)

Year of the vaccine

- Pneumococcal vaccines: vaccines target the bacterium Streptococcus pneumoniae was first licensed in 1977 and in children in 2000
- Vaccination of infants for Haemophilus influenzae type B began in 1988
- In 1983, PPSV23 was licensed (Pneumococcal polysaccharide vaccine)
- In 2000, PCV13 was licensed by FDA (Pneumococcal conjugate vaccine)
- Two types of vaccine:
 - PPSV23 protects against 23 types of pneumonia bacteria
 - + Adults >=65
 - + 2 to 64 years old with certain medical conditions
 - + Adults 19 through 64 years old who smoke cigarettes
 - PCV13 protects from 13 types of bacteria
 - + Children younger than 2 years old are recommended.
 - + People 2 years or older with certain medical conditions
 - + Adults 65 years or older also can discuss and decide, with their clinician, to get PCV13.
- *Cannot take 2 types at the same time
- *Both vaccine should be taken by adult >=65, PCV13 first, at least 1 year later to take PPSV23
- *Don't take vaccine if...
- + PCV13: Allergy to the vaccine components, you are not feeling well
- + PPSV23: Allergy to the vaccine components, you are not feeling well, pregnancy

References

- Mayo Clinic Staff. Pneumonia. (2020, June 13). Retrieved September 07, 2020, from <https://www.mayoclinic.org/diseases-conditions/pneumonia/symptoms-causes/syc-20354204>
- BASS Urgent Care. (2020, January 9). Four Stages of Pneumonia | Blog | BASS Advanced Urgent Care. <https://www.bassadvancedurgentcare.com/post/four-stages-of-pneumonia?fbclid=IwAR2vSquJT696TWaFP4vYzIpHkCX2WRRRS0jyoDkCC2TwUdEZOngdFA>
- Feigin R (2004). *Textbook of Pediatric Infectious Diseases* (5th ed.). Philadelphia: W. B. Saunders. p. 299. ISBN 0781721693293
- Friedländer C (4 February 1882). "Über die Schizomycoeten bei den acuten herditären Pneumonien". *Archiv für Pathologische Anatomie und Physiologie und für Klinische Medizin*. 87 (2): 319–24. doi:10.1007/BF01880516. S2CID 28324193
- Fraenkel A (21 April 1884). "Über die genuine Pneumonia. Verhandlungen des Congress für innere Medizin". *Dritter Congress*. 3: 17–31.
- John H. Hodge MD (1989). Wagner, MD, Frederick B (ed.). *Thomas Jefferson University, Tradition and Heritage*. Jefferson Digital Commons. Part III, Chapter 9. Department of Medicine. p. 253.
- Schali-Schulman, J. (2020, June 9). What to Know About COVID-19 and Pneumonia. Healthline. <https://www.healthline.com/health/coronavirus-pneumonia?fbclid=IwAR2vSquJT696TWaFP4vYzIpHkCX2WRRRS0jyoDkCC2TwUdEZOngdFA#symptoms>
- Sharma S, Maycher B, Eschun G (May 2007). "Radiological imaging in pneumonia: recent innovations". *Current Opinion in Pulmonary Medicine*. 13 (2): 159–69. doi:10.1097/MCP.0b013e328030484. PMID 17414122. S2CID 39564602
- Eddy, Olin (December 2005). "Community-Acquired Pneumonia: From Common Pathogens To Emerging Resistance". *Emergency Medicine Practice*. 7 (12): 13–17.
- Table 13-7 in: Mitchell, Richard Shoppard; Kumar, Vinay; Abbas, Abul K.; Fausto, Nelson (2007). *Robbins Basic Pathology: With STUDENT CONSULT Online Access*. Philadelphia: Saunders. ISBN 978-1-4160-2972-1. 8th edition.
- Huang, Chaolin; Wang, Yeming; Li, Xingwang; Ren, Li; Zhao, Jiarong; Hu, Yi; Zhang, Li; Fan, Guohui; Xu, Juyang; Gu, Xiaoying; Cheng, Zhengshun; Yu, Ting; Xia, Jiaan; Wei, Yuan; Wu, Wenjuan; Xiao, Xueli; Wen, Li; Hui, Liu; Min, Xiao; Yan, Gang; Hong, Guo; Li, Xie, Juegang; Wang, Guangf; Jiang, Rongmeng; Gao, Zhancheng; Jin, Qi; Wang, Jianwei; Cao, Bin (15 February 2020). "Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China". *The Lancet*. 395 (10233): 497–506. doi:10.1016/S0140-6736(20)30183-5. PMC 7159299. PMID 31888564

- Eddy, Olin (December 2005). "Community-Acquired Pneumonia: From Common Pathogens To Emerging Resistance". *Emergency Medicine Practice*. 7 (12): 13–17.
- Wainwright, D. (2010). Chapter 37.
- Villines, Z. (2017, October 1). *Is pneumonia contagious?* Medical News Today. <https://www.medicalnewstoday.com/articles/319581#transmission>
- Pneumonia Treatment and Recovery*. (2020, May 27). American Lung Association. <https://www.lung.org/lung-health-diseases/lung-disease-lookup/pneumonia/treatment-and-recovery?fbclid=IwAR2vSquJT696TWaFP4vYzIpHkCX2WRRRS0jyoDkCC2TwUdEZOngdFA>
- Whitney CG, Farley MK, Hadler J, Harrison LH, Bennett NM, Lyrfield R, et al. (Active Bacterial Core Surveillance of the Emerging Infections Program Network) (May 2003). "Decline in invasive pneumococcal disease after the introduction of protein-polysaccharide conjugate vaccine". *The New England Journal of Medicine*. 348 (18): 1737–46. doi:10.1056/NEJMoa022623. PMID 12724478
- Prevent pneumonia*. (2020, March 9). Centers for Disease Control and Prevention. <https://www.cdc.gov/pneumonia/prevention.html?fbclid=IwAR2vSquJT696TWaFP4vYzIpHkCX2WRRRS0jyoDkCC2TwUdEZOngdFA#%7Etext=There%20are%20two%20vaccines%20that%20protect%20against%20disease%3A%20PCV13%20and%20PPSV23.&text=CDC%20recommends%20all%20adults%20aged%2065%20and%20older%20to%20get%20PPSV23>
- Pneumococcal Vaccination | What You Should Know | CDC*. (2019, November 21). Centers for Disease Control and Prevention. <https://www.cdc.gov/vaccines/pd/pneumo/public/index.html?fbclid=IwAR2vSquJT696TWaFP4vYzIpHkCX2WRRRS0jyoDkCC2TwUdEZOngdFA>
- Brooks, L. R. K. (2020, September 7). *Streptococcus pneumoniae's Virulence and Host Immunity: Aging, Diagnostics, and Prevention*. *Frontiers*. <https://www.frontiersin.org/articles/10.3389/fimm.2018.01366/full>