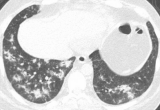



Viral Infections

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School of Medicine and Public Health

CHESTRAD 2023
A Case Review and Lecture Series
Saturday 15th July - Sunday 16th July - Monday 17th July
27 CPD Points

1

Introduction


- Viruses are increasingly common causes of respiratory infection
- Normal hosts – “atypical pneumonia”
- Immunocompromised – “viral pneumonia”

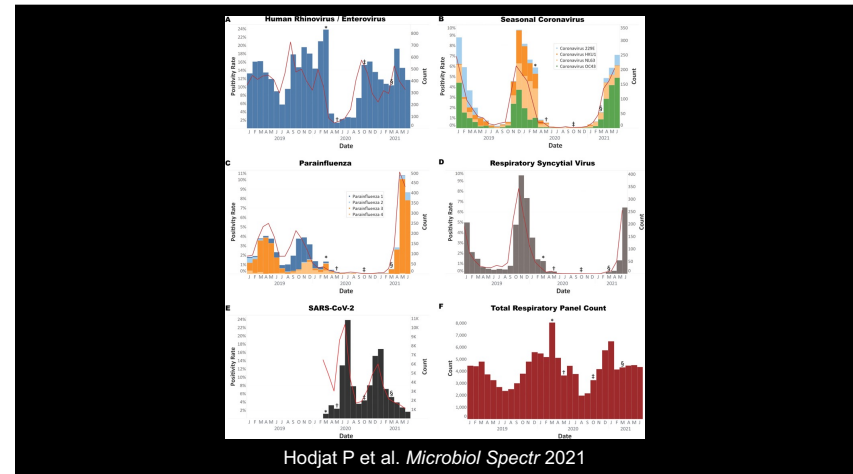
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Introduction

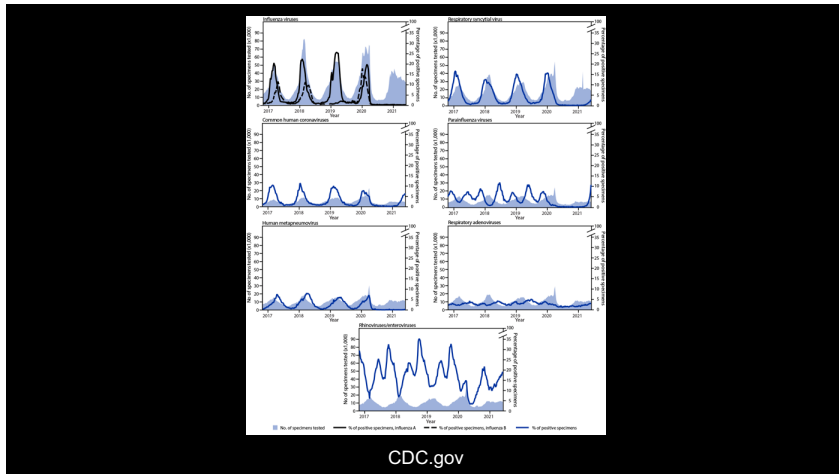
- Most infections in normal hosts have similar manifestations.
- Influenza usually account for most respiratory viral infections in otherwise healthy patients.
- Pandemics and seasonal variation can result in increases of other viral infections.



3



4



5

Objectives

- List common virus affecting the lungs
- Illustrate common imaging findings associated with viral pneumonia
- Recognize the limitations of imaging for identifying the causative agent or even class of agent in the setting of infectious pneumonia

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Influenza Virus

- Influenza A responsible for most morbidity and mortality
- Seasonal variation
- Sporadic pandemics

CDC.gov

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Influenza Virus

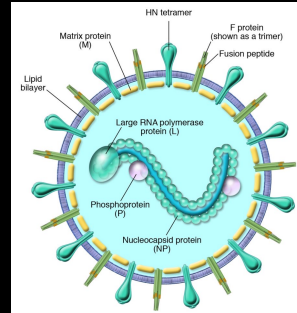
Organizing pneumonia

Diffuse alveolar damage

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Parainfluenza Virus

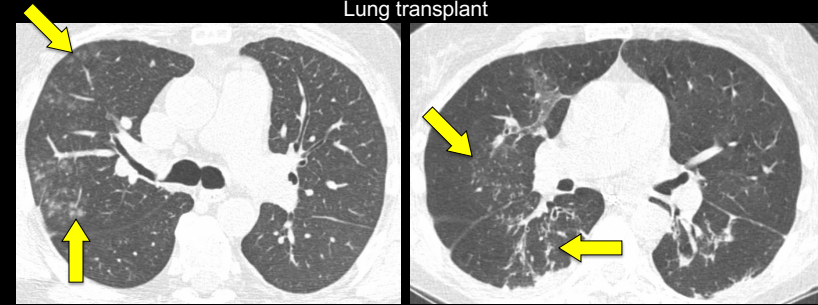
- Common cause of seasonal URIs in adults and children
- Type 1-4
 - 4 rare
 - 3 responsible for severe illness in solid organ transplant



Moscona A. *J Clin Invest.* 2005

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Parainfluenza Virus 3



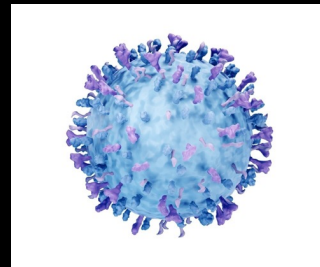
Bronchiolitis

Bronchiolitis/bronchitis & chronic GVHD

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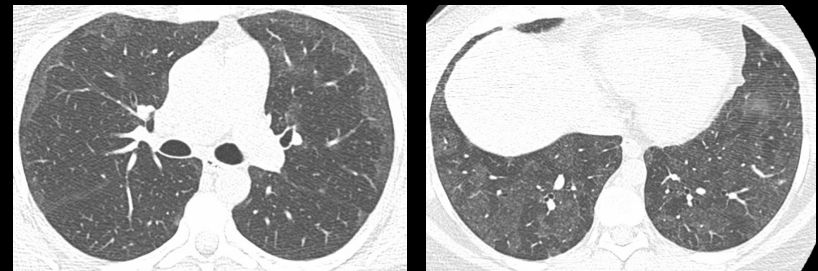
Respiratory Syncytial Virus

- Worldwide distribution with seasonal variation
- Most common viral cause of pneumonia in very young children
- Milder disease in older children and adults



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Respiratory Syncytial Virus



Organizing pneumonia

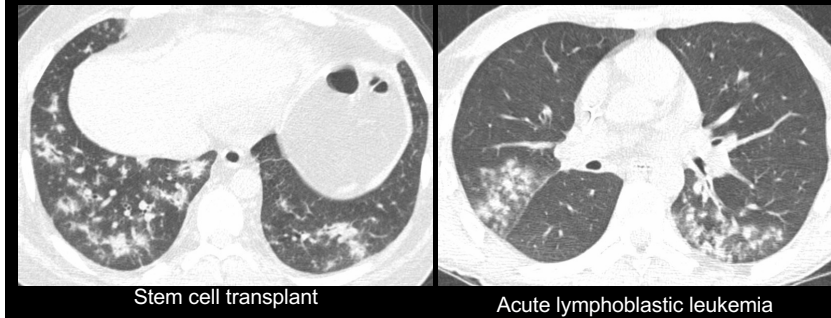
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Respiratory Syncytial Virus



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Respiratory Syncytial Virus



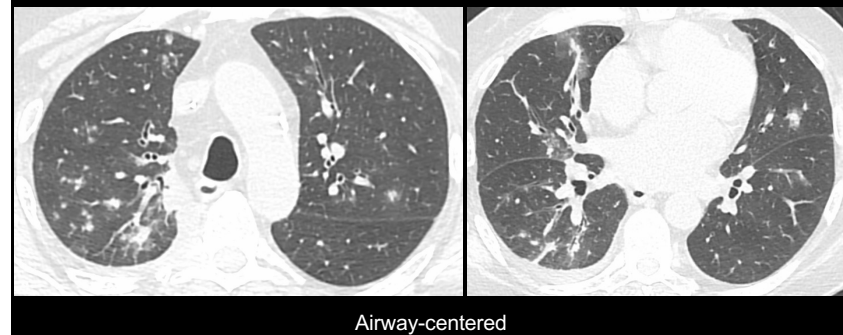
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Human Metapneumovirus

- Discovered in 2001
- Same family as RSV with similar clinical manifestations
- Can cause severe illness in immunocompromised hosts and lead to lung fibrosis

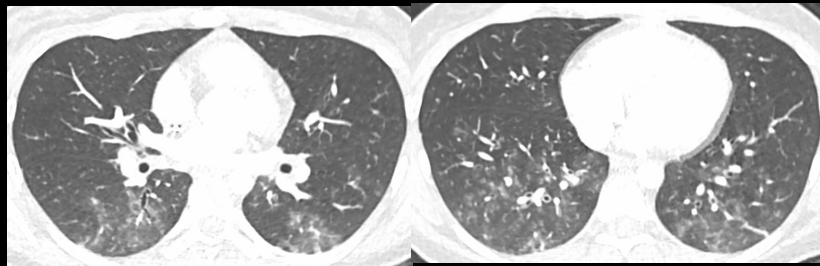
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Human Metapneumovirus



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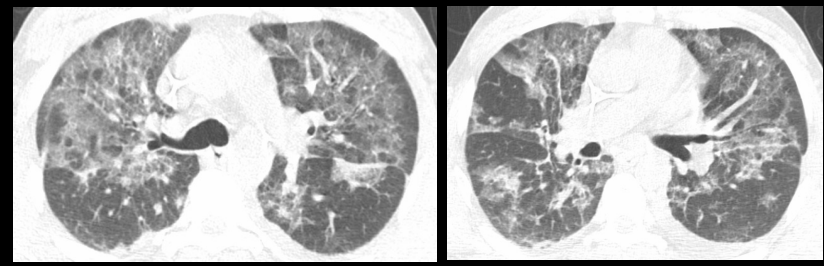
Human Metapneumovirus



Airway-centered

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Human Metapneumovirus



Hematopoietic cell transplant

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Coronaviruses

- Common causes of human upper respiratory tract infections
- Animal-to-human transmission (SARS, COVID-19, MERS)
- Pneumonia often manifests as organizing pneumonia or diffuse alveolar damage

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Coronaviruses

- | | |
|-------------------|---------------|
| • Major outbreaks | • Circulating |
| –SARS-CoV-1 | –229E |
| –SARS-CoV-2 | –NL63 |
| –MERS-CoV | –OC43 |
| | –HKU1 |

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Coronaviruses

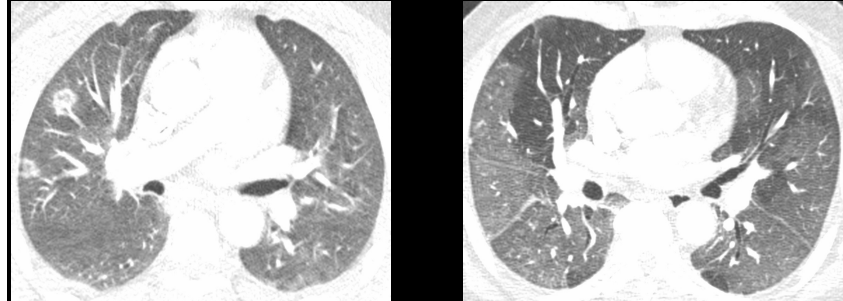


SARS-CoV-1

Franquet T. et al. *Br J Radiol.* 2020

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Coronaviruses



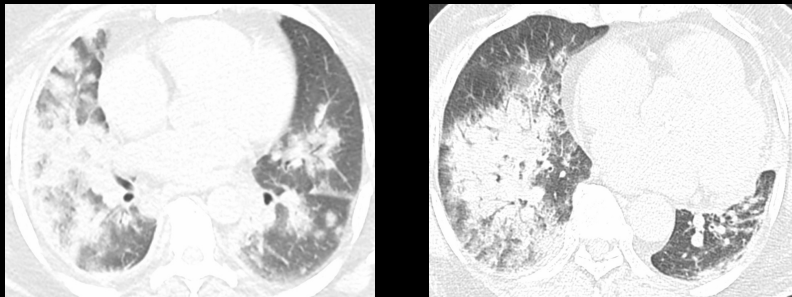
Organizing pneumonia

SARS-CoV-2

Diffuse alveolar damage

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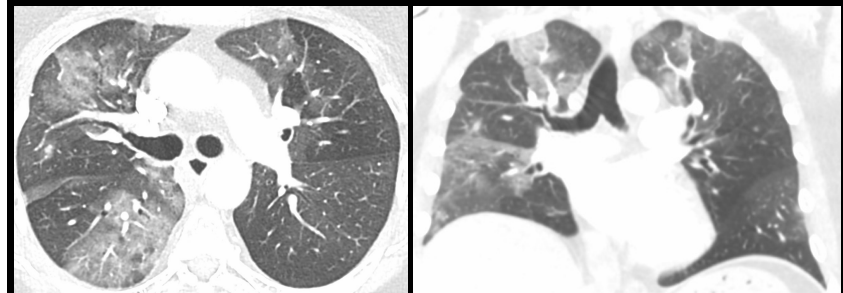
Coronaviruses



MERS

23

Coronaviruses

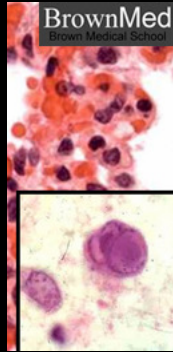


Seasonal non-SARS coronavirus

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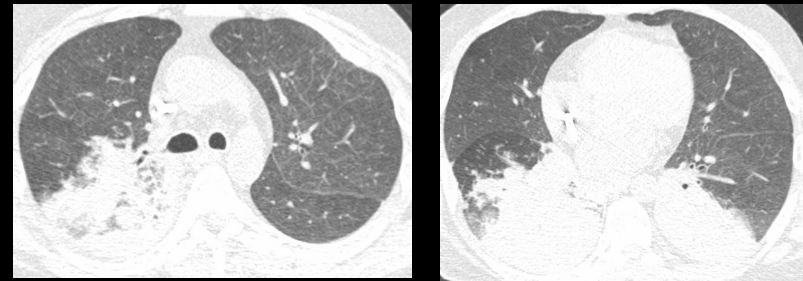
Adenovirus

- Human reservoir > 50 serotypes
- Serotypes 1-3, 7 responsible for respiratory illness
- Seasonal (fall to spring) primarily occurring in children
- Increasingly recognized in immunocompromised patients



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Adenovirus



Kidney transplant

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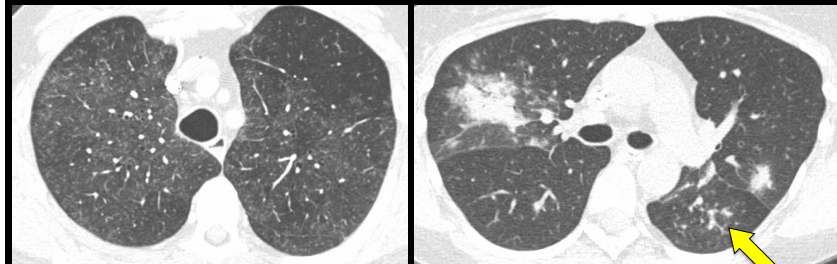
Adenovirus



Multiple myeloma

27

Adenovirus



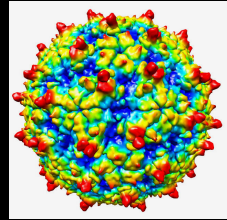
Hematopoietic stem cell transplant

T-cell leukemia

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Rhinovirus

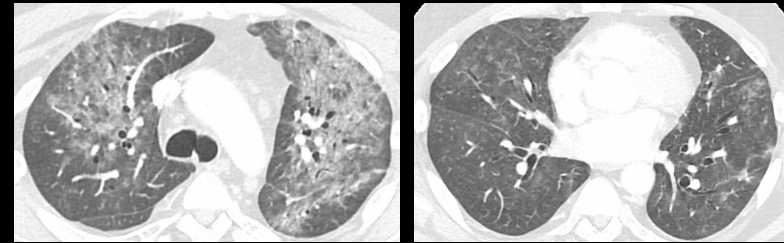
- Very common cause of URIs in adults and children
- Increasingly recognized as cause of pneumonia in immunocompromised patients
- Can occur in conjunction with other pathogens



NIH

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Rhinovirus

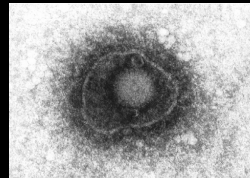


Controlled HIV and chemotherapy for bladder cancer

30

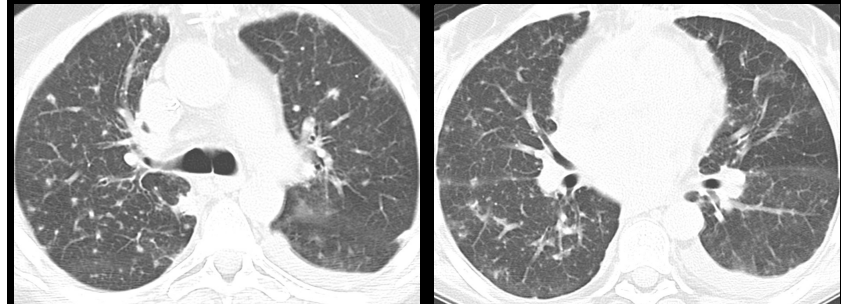
Varicella-Zoster Virus

- Pneumonia estimated to develop in 1:400 adults with chicken pox
- Immunocompromised and pregnant patients at greater risk
- Clue is the presence of skin lesions



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Varicella-Zoster Virus



Heart transplant

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Varicella-Zoster Virus

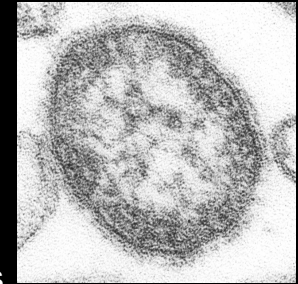


Kidney and pancreas transplant

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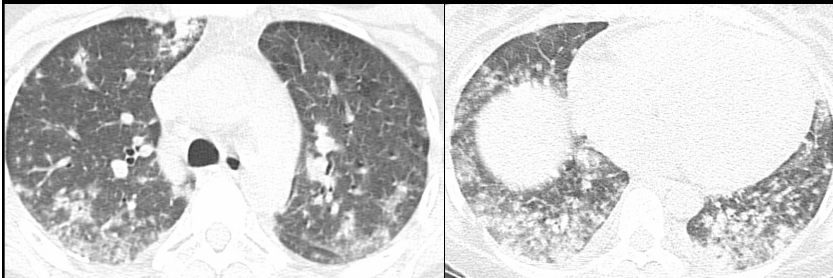
Measles Virus

- 1.5 million childhood deaths annually
- Increasing cases in US because of declining vaccinations
- Severe disease in immunocompromised patients



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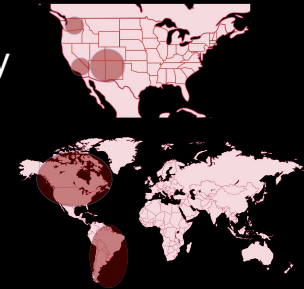
Measles Virus



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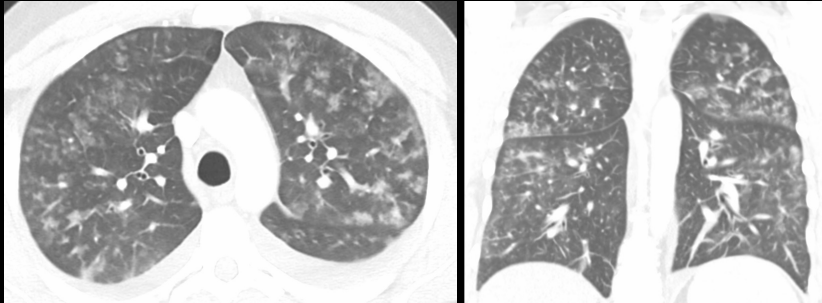
Hantavirus

- New World hantaviruses cause hantavirus pulmonary syndrome (HPS)
- HPS includes lung edema, hypotension, respiratory failure and cardiogenic shock



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Hantavirus



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Opportunistic Infections

- Cytomegalovirus
- Human herpes virus

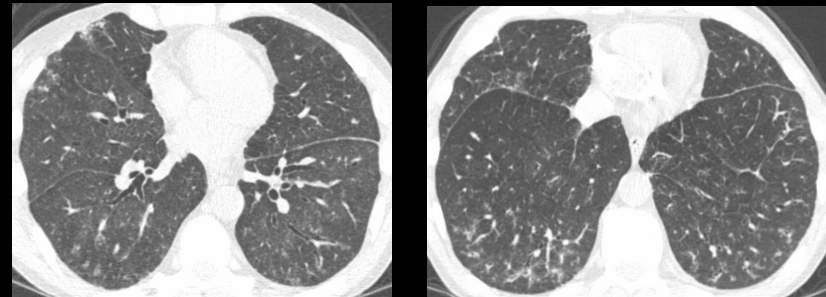
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Cytomegalovirus

- Major cause of morbidity and mortality in transplant and HIV patients
- CMV viremia or antigenemia highly suggestive of active infection
- May contribute to allograft rejection in lung transplant recipients

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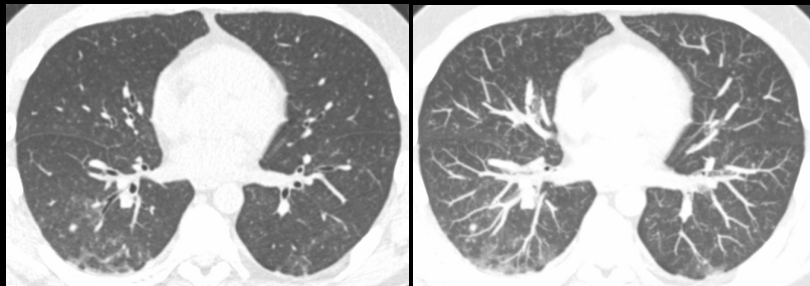
Cytomegalovirus



Lung transplant

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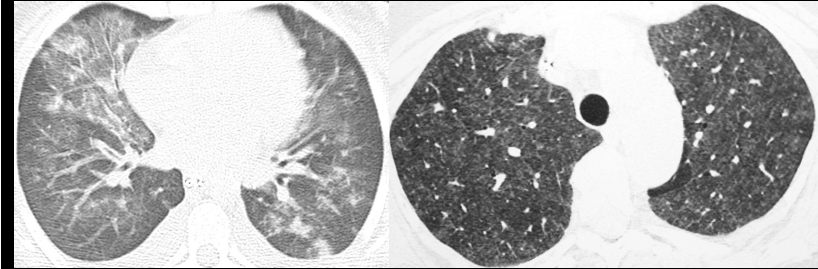
Cytomegalovirus



Kidney transplant

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Cytomegalovirus

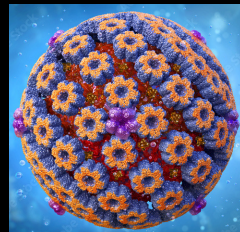


Allogeneic stem cell transplant

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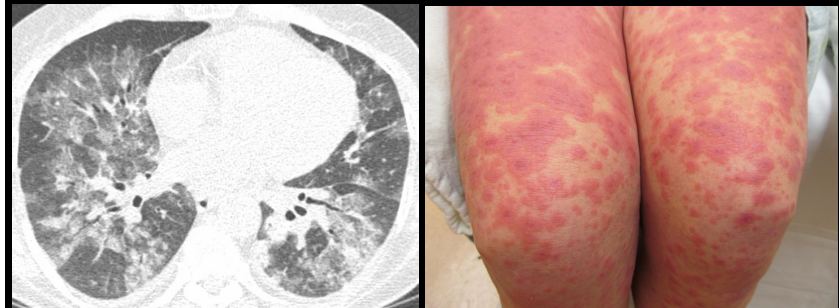
Herpes Simplex Virus

- Rare with poor outcome
- Almost exclusively in immunocompromised patients or mechanically ventilated patients
- Often in conjunction with other respiratory infection



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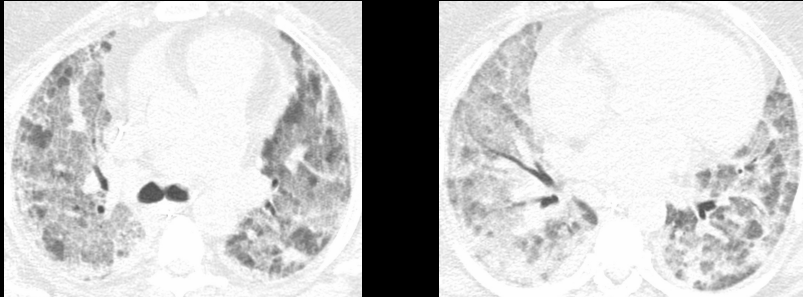
Herpes Simplex Virus



🔑 Rash may be a clue to viral infection

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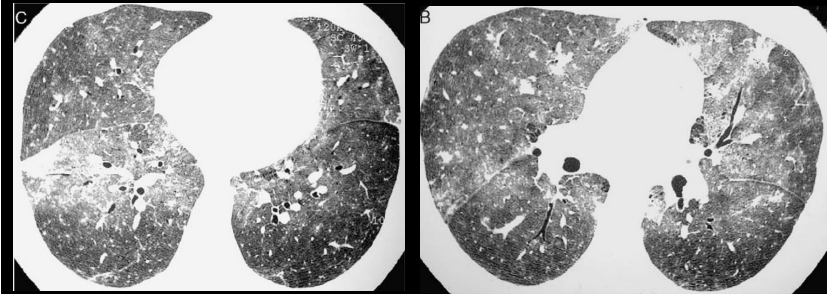
Herpes Simplex Virus



Ventilated, T-cell leukemia

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Herpes Simplex Virus



HSV-2 hematopoietic stem cell transplant

Kanne JP et al. *J Thorac Imaging* 2007

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Summary

- Viral infections are common causes of community acquired pneumonia and opportunistic infections
- Distinguishing viral infection from other etiologies is nearly impossible
- Clues such as rashes or exposures may help in suggest the diagnosis

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