

# Pneumocystis jiroveci

## Clinical Background

*Pneumocystis* is a fungal organism that causes pneumonia predominantly in immunocompromised patients.

### Epidemiology

- Incidence
  - In AIDS patients, <1/100
  - In solid organ transplant patients not taking prophylactic antibiotics – 5-10/100
- Sex – M>F, in AIDS patients
- Transmission – airborne droplet

### Organism

- Classified as a fungus because RNA is homologous to fungal RNA
- Four morphological forms – trophozoites, cysts, precysts, sporozoites
- Cyst is diagnostic form and stains with Giemsa and methenamine silver stains
- Formerly known as *Pneumocystis carinii*, sp. *hominis*

### Risk Factors

- Immunocompromised patient (particularly solid organ transplant patients)
- AIDS (CD4+ <200 cells/ $\mu$ L)
- Heart/lung transplant patients coinfecting with cytomegalovirus (CMV)

### Clinical Presentation

- Subacute to acute onset pneumonia
- Dyspnea, tachypnea, cyanosis, nonproductive cough, fever
  - Hypoxemia
- Coinfection with CMV
- Complications
  - Acute respiratory failure
  - Pneumothorax/pneumomediastinum

### Treatment

- Antibiotics
- Glucocorticoids – appear to accelerate recovery
  - Most studied in AIDS patients

### Prevention

- Prophylactic use of oral trimethoprim-sulfamethoxazole or inhaled pentamidine significantly reduces the disease rate in at-risk populations

## Diagnosis

- Indications for testing – fever, shortness of breath and cough in immunocompromised patients (particularly HIV-at-risk or HIV-positive patients)
- Laboratory testing
  - PCR – more sensitive than direct fluorescent antibody (DFA) staining; may be particularly useful on non-HIV infected immunocompromised host
  - DFA staining using monoclonal antibodies on induced sputum or bronchoalveolar lavage (BAL)

- May also perform Grocott's methenamine silver nitrate stain and/or Giemsa stain on lung tissue biopsies
- Sensitivity of sputum staining – 70-80%
- Cytopathologic examination of Pap-stained BAL fluid
- Imaging studies
  - Chest x-ray – bilateral symmetric ground glass opacities
    - 10% are normal
  - CT (high resolution) – ground glass opacities

## Lab Tests

### Indications for Laboratory Testing

Tests generally appear in the order most useful for common clinical situations. For test-specific information, refer to the test number in the ARUP Laboratory Test Directory on the ARUP Web site at [www.aruplab.com](http://www.aruplab.com).

Test Name and Number	Recommended Use	Limitations	Follow Up
<i>Pneumocystis jiroveci</i> DFA 0060052 Method: Direct Fluorescent Antibody Stain	Rapid identification of <i>P. jiroveci</i>		
Parasites Smear (Giemsa Stain), Blood 0049025 Method: Stain	Rapid identification of <i>P. jiroveci</i>		
(1,3) B-D-Glucan 2002434 Method: Colorimetric Assay	Detect <i>P. jiroveci</i>		
Immunohistochemistry Stain Offering arup005 Method: Immunohistochemistry	Rapid identification of <i>P. jiroveci</i> (Grocott's methenamine silver [GMS] method)		

### General References

Davaro RE, Thirumalai A. Life-threatening complications of HIV infection. *J Intensive Care Med.* 2007; 22 (2) 73-81.

Fujii T, Nakamura T, Iwamoto A. Pneumocystis pneumonia in patients with HIV infection: clinical manifestations, laboratory findings, and radiological features. *J Infect Chemother.* 2007; 13 (1) 1-7.

Huang L, Morris A, Limper AH, Beck JM. An Official ATS Workshop Summary: Recent advances and future directions in pneumocystis pneumonia (PCP). *Proc Am Thorac Soc.* 2006; 3 (8) 655-664.

Lu JJ, Lee CH. Pneumocystis pneumonia. *J Formos Med Assoc.* 2008; 107 (11) 830-842.

Morris A, Lundgren JD, Masur H, Walzer PD, Hanson DL, Frederick T, Huang L, Beard CB, Kaplan JE. Current epidemiology of Pneumocystis pneumonia. *Emerg Infect Dis.* 2004; 10 (10) 1713-1720.

Nevez G, Chabe M, Rabodonirina M, Virmaux M, Dei-Cas E, Hauser PM, Totet A. Nosocomial Pneumocystis jirovecii infections. *Parasite.* 2008; 15 (3) 359-365.

Ong EL. Common AIDS-associated opportunistic infections. *Clin Med*. 2008; 8 (5) 539-543.

Peterson JC, Cushion MT. Pneumocystis: not just pneumonia. *Curr Opin Microbiol*. 2005; 8 (4) 393-398.

Pitcher RD, Zar HJ. Radiographic features of paediatric pneumocystis pneumonia -- a historical perspective. *Clin Radiol*. 2008; 63 (6) 666-672.

Pneumocystis jiroveci (formerly Pneumocystis carinii). *Am J Transplant*. 2004; 4 Suppl 10 135-141.

Robberts FJ, Liebowitz LD, Chalkley LJ. Polymerase chain reaction detection of Pneumocystis jiroveci: evaluation of 9 assays. *Diagn Microbiol Infect Dis*. 2007; 58 (4) 385-392.

### **Reviewed by**

Hanson, Kimberly E., MD, MHS. Assistant Medical Director, Infectious Diseases at ARUP Laboratories; Assistant Professor of Medicine and Pathology, University of Utah

### **Related Content**

Human Immunodeficiency Virus - HIV

Comprehensive Review: July 2009

Last Update: August 2009