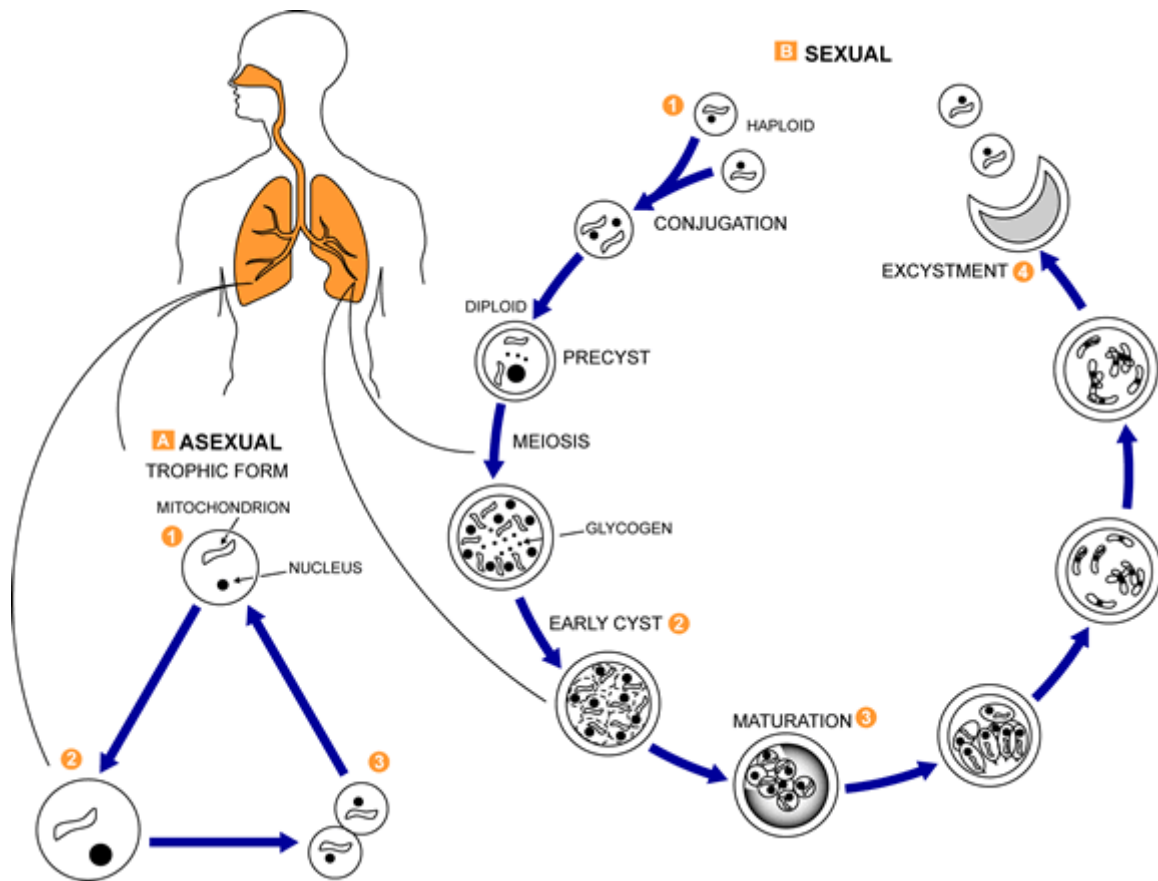


Pneumocystis infection

Causal Agent:

Pneumocystis jirovecii (previously classified as *Pneumocystis carinii*) was previously classified as a protozoa. Currently, it is considered a fungus based on nucleic acid and biochemical analysis.

Life Cycle:



This is a generalized life cycle proposed by John J. Ruffolo, Ph.D. (Cushion, MT, 1988) for the various species of *Pneumocystis*. These fungi are found in the lungs of mammals where they reside without causing overt infection until the host's immune system becomes debilitated. Then, an oftentimes lethal pneumonia can result. Asexual phase: trophic forms ① replicate by mitosis ② to ③. Sexual phase: haploid trophic forms conjugate ① and produce a zygote or sporocyte (early cyst) ②. The zygote undergoes meiosis and subsequent mitosis to produce eight haploid nuclei (late phase cyst) ③. Spores exhibit different shapes (such as, spherical and elongated forms). It is postulated that elongation of the spores precedes release from the spore case. It is believed

that the release occurs through a rent in the cell wall. After release, the empty spore case usually collapses, but retains some residual cytoplasm ⁴. A trophic stage, where the organisms probably multiply by binary fission is also recognized to exist. The organism causes disease in immunosuppressed individuals.

Geographic Distribution:

Worldwide, in humans and animals. Serologic evidence indicates that most healthy children have been exposed by age 3 to 4. *Pneumocystis* pneumonia (PCP) occurs in immunosuppressed individuals and in premature, malnourished infants.

Clinical Features:

The symptoms of *Pneumocystis* pneumonia (PCP) include dyspnea, nonproductive cough, and fever. Chest radiography demonstrates bilateral infiltrates. Extrapulmonary lesions occur in a minority (<3%) of patients, involving most frequently the lymph nodes, spleen, liver, and bone marrow. Typically, in untreated PCP increasing pulmonary involvement leads to death.

Laboratory Diagnosis:

The specific diagnosis is based on identification of *P. jiroveci* in bronchopulmonary secretions obtained as induced sputum or bronchoalveolar lavage (BAL) material. In situations where these two techniques cannot be used, transbronchial biopsy or open lung biopsy may prove necessary. Microscopic identification of *P. jiroveci* trophozoites and cysts is performed with stains that demonstrate either the nuclei of trophozoites and intracystic stages (such as Giemsa) or the cyst walls (such as the silver stains). In addition, immunofluorescence microscopy using monoclonal antibodies can identify the organisms with higher sensitivity than conventional microscopy.

Diagnostic findings

- Microscopy
- Molecular methods

Treatment:

Trimethoprim-sulfamethoxazole is the drug of choice. Recommended alternatives include pentamidine; trimethoprim plus dapsone*; atovaquone; and primaquine* plus clindamycin

* This drug is approved by the FDA, but considered investigational for this purpose.