

Parasitology

3rd Stage

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Pneumocystis carinii (*P. jiroveci*)

- ❖ Opportunistic organism
- ❖ Cause interstitial plasma cell pneumonia

Life cycle

- ✓ Mode of infection: inhalation of mature cyst.
- ✓ Two forms: cyst and trophozoite
- ✓ Trophozoites are amoeboid in shape with one nucleus. mature cyst contain 8 trophozoites. → Mature cyst inhaled → rupture → trophozoites → multiply → precyst → cyst.
- ✓ Trophozoite, precyst and cyst stages of PC can be found suspended in a frothy, honeycombed foamy exudate.
- ✓ Mature cysts contain eight intracystic bodies known as sporozoites.
- ✓ Trophozoites are small and pleomorphic ranging from 1 to 5 μm in size. In Giemsa stain trophozoites contain red dot like nucleus surrounded by pale blue cytoplasm.
- ✓ Precysts are oval measuring 4 to 6 μm without intracystic bodies, but may have one or more nuclei.
- ✓ Mature cysts are thick & thin walled measuring 5 to 8 μm containing intracystic bodies.
- ✓ Thin walled cysts rupture and release sporozoites that in turn multiply by binary fission or initiate sexual cycle.
- ✓ Giemsa stains intra cystic bodies and trophozoites, but does not stain cyst walls.

Symptoms in patient with problem other than ADIS:

- ✚ The parasite is opportunistic. Abnormalities of pulmonary surfactant is a risk factor which may ultimately modify the organism from saprophyte to pathogen.
- ✚ Incubation period 2 months.
- ✚ Non productive cough, diffuse rales. no fever, severe respiratory distress.

Symptoms in patients with ADIS:

- ☒ Incubation period: 40 days to one year.
- ☒ Weight loss, diarrhea, non productive cough ,progressive dyspnea, low grade fever, rales (maybe), presence of cotton wool spots in the fundus of eye.
- ☒ Both cyst and trophozoite recovered in alveolar space in infected lung tissue.
- ☒ Serous fluid and other cells are found in the interstitial space and alveoli of the lung.
- ☒ Extrapulmonary *P. carinii* also recorded in brain, lymph node, spleen, liver, gastrointestinal tract, bone marrow, myocardium and other tissues.

Diagnosis

1. Demonstration of the parasite in material from:
 - Transbronchial biopsy
 - Touch prints
 - Bronchoalveolar lavage
 - Induced sputum in ADIS patients.
 - The smear stained by modified acid fast or toluidine blue or giemsa.
2. serological test using monoclonal antibody.
3. PCR.

Treatment:

Co-trimoxazole.

N.B.

With the DNA –based recognition of *P. jiroveci* (formerly *P. carinii*) as a fungus and hence its de facto transfer out of the field of parasitology, a discussion of this agent here is no longer appropriate .

Balantidium Coli

- ❖ *Balantidium coli* is the largest protozoan parasite in humans and causes a disease called balantidiasis.
- ❖ It belongs to the ciliophora phylum and is the only protozoan ciliate to infect humans.
- ❖ It goes through two development phases; a cyst and a trophozoite.

Trophozoites

- ✓ are 0.03–0.15 mm long and 0.025–0.12 mm wide.
- ✓ Their shape is either spherical or oblong.
- ✓ Their surface is covered with cilia and are able to move around.
- ✓ Trophozoites have both a micronucleus and a macronucleus, which both are normally visible. The macronucleus is bigger and sausage-shaped whereas the micronucleus is less notable.

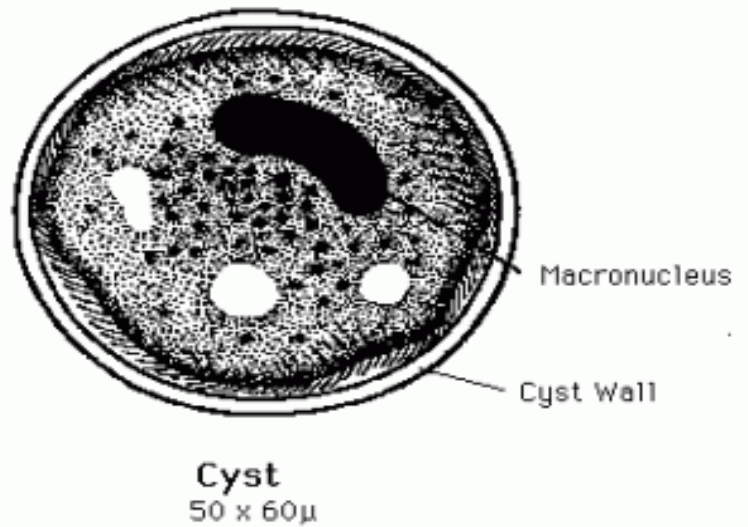
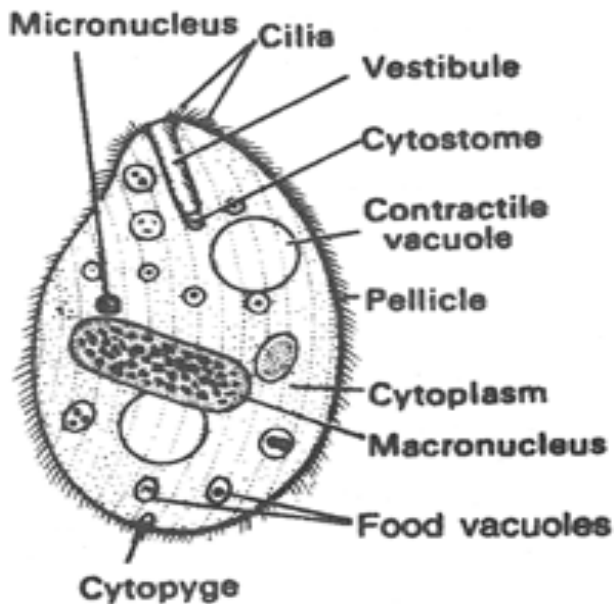
Cysts

- ✚ are spherical and 0.04–0.06 mm in diameter.
- ✚ They have a tough multilayered shell which protects them against stomach acid of the host, when ingested.
- ✚ They are usually destroyed at a pH lower than five (normal pH of a healthy stomach is about three).
- ✚ Some people are weakened by other diseases and thus the cysts are not killed.
- ✚ Unlike trophozoites, cysts cannot reproduce and do not have any cilia for moving.

Balantidium coli lives in the cecum and colon of humans, pigs, rats and other mammals.

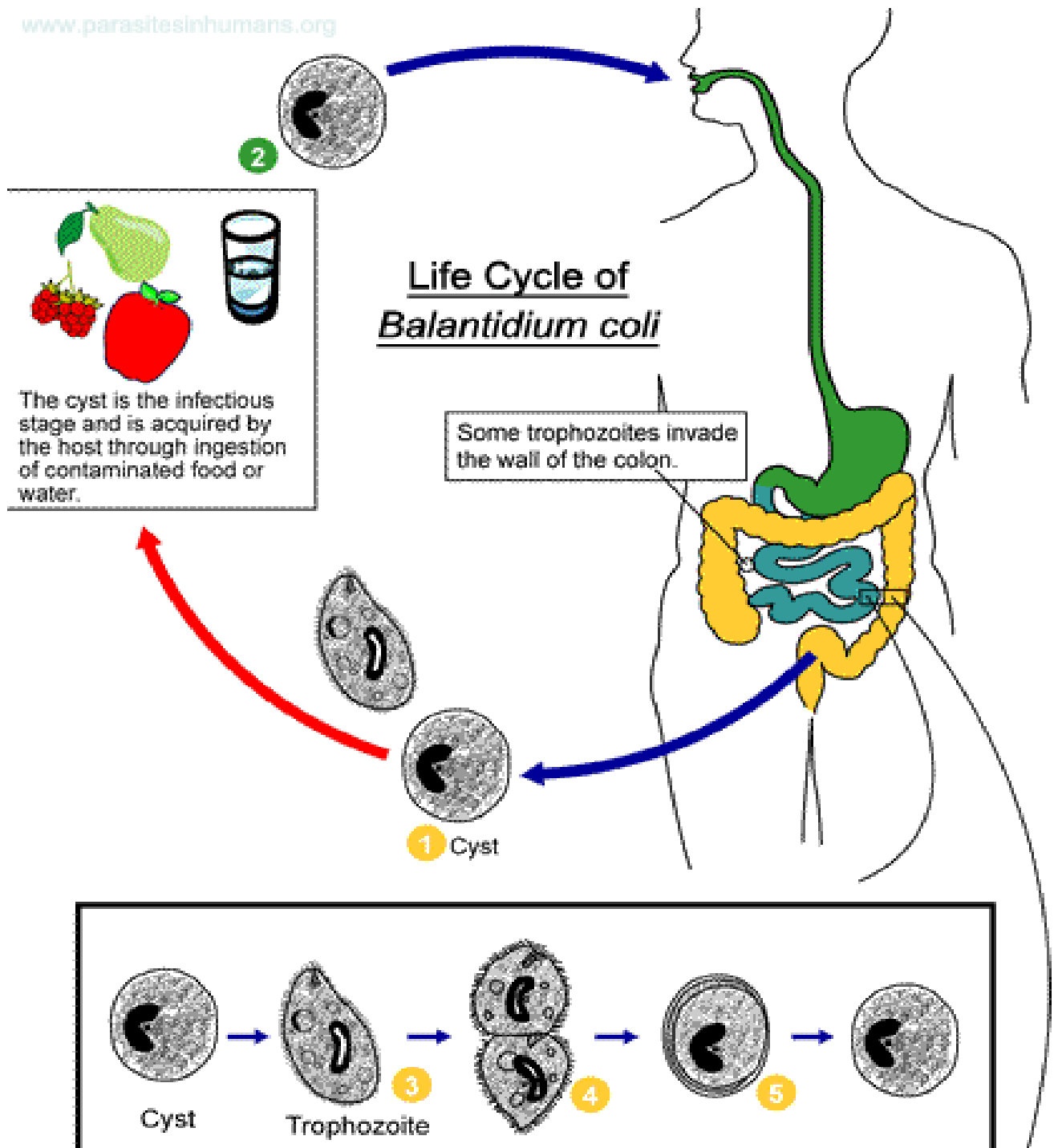
It is not readily transmissible from one species of host to another because it requires a period of time to adjust to the symbiotic flora of the new host.

Once it has adapted to a host species, the protozoan can become a serious pathogen, especially in humans.



Life cycle

- ☒ The life cycle of *Balantidium coli* begins, when a human eats food or water that has been contaminated with infective cysts.
- ☒ If the cysts survive through the stomach, trophozoites are formed in the small intestine.
- ☒ Trophozoites live in the cecum and the colon of the large intestine. They live and feed in the lumen but sometimes penetrate the mucosa.
- ☒ They multiply by transverse binary fission in the intestinal wall.
- ☒ Some trophozoites return to the lumen and encyst (transform into cysts) once the feces dry up.
- ☒ The cysts are formed either in the large intestine or outside of the body.
- ☒ If the feces get in contact with vegetables or drinking water, humans might ingest the cysts.



- ❖ About 1 % of the world's population is infected with balantidiasis.
- ❖ Most infections occur in developing countries where feces are more likely to get in contact with food and drinking water.
- ❖ In addition to humans, pigs and other animals carry the disease.
- ❖ People who raise pigs have bigger risk of getting infected with balantidiasis.

- ❖ Balantidiasis is often **asymptomatic**. But in some cases the patient might have **diarrhea, weight loss and dysentery**.
- ❖ Dysentery is an inflammatory disorder of the intestine, particularly of the colon, that causes severe diarrhea containing blood and/or mucus in the feces with **stomach pain and fever**. Untreated dysentery cases **can be fatal**. Symptoms are commonly more severe in impaired (weakened by other diseases) patients.
- ❖ Although *Balantidium coli* usually resides in the lumen of its host, trophozoites can invade the mucosa of the large intestine (cecum and colon) and cause ulcerations.
- ❖ The parasite secretes a substance called hyaluronidase enzyme, which helps degrade intestinal tissue and facilitates penetration of the mucosa.
- ❖ Other bacteria in the intestine may enter the ulcer along with *Balantidium coli*, leading to secondary infections.
- ❖ Ulcerations of the large intestine can be viewed using sigmoidoscopy (wide mouth ulcer).

Diagnosis

- ✓ can be made by finding trophozoites from a stool or tissue sample (collected during endoscopy).
- ✓ Cysts are rarely found.
- ✓ Trophozoites are passed irregularly and quickly destroyed outside the colon. For this reason many stool samples are usually required to confirm the disease.

Balantidiasis is **treated** with tetracycline according to the instructions of your health care provider. Tetracycline is not recommended for pregnant women or children under 8 years old. If the drug is not available, then iodoquinol and metronidazole can be used.

Prevention

Preventative measures require effective personal and community hygiene.

Some specific safeguards include the following:

1. Purification of drinking water.
2. Proper handling of food.
3. Careful disposal of human feces.
4. Monitoring the contacts of balantidiasis patients.