Peritonitis
Your objectives

After completing this section, you should be able to:

• Describe peritonitis.
• Explain how germs can get into your peritoneal cavity.
• Identify the signs and symptoms of peritonitis.
• Know how to treat peritonitis.

What is peritonitis?

Peritonitis is an infection of the peritoneal membrane. If it is not treated promptly, this infection can be life-threatening. Repeated peritonitis can damage the peritoneal membrane until it is no longer able to filter effectively. If this happens, your nephrologist will recommend hemodialysis to treat your chronic renal failure.

What causes peritonitis?

Peritonitis occurs when germs get into the peritoneal cavity. This can happen in several ways:

• Carelessness while performing dialysis procedures:
  – Not wearing a mask while doing sterile procedures
  – Poor hand washing
  – Ignoring contamination and not taking corrective actions
  – Having someone do your exchange who has not been trained in sterile and clean techniques
• Unclean surroundings when doing an exchange. Too much air movement in the room while making connections can increase the chances of infection.
• An accidental disconnect, especially if the situation is not treated properly. (See Mayo Clinic publication Peritoneal Dialysis Problems: Technical and Physical, MC1697-11.)
• A ruptured intestine. In this rare situation, germs from the bowel enter the peritoneal cavity.
Signs and symptoms of peritonitis

Watch for these signs and symptoms of peritonitis. If you are experiencing one or more of these, you may have peritonitis. Drain and examine your effluent.

• Cloudy effluent (the most common sign)
  - Effluent should be clear
  - If it is not clear (hazy, cloudy or milky), assume an infection has occurred and begin treatment as instructed
• Abdominal pain or cramps (mild or severe)
• Abdominal bloating (mild or severe) or fullness
• Fibrin (See Mayo Clinic publication Peritoneal Dialysis Problems: Fibrin and Heparin Treatment, MC1697-10.)
• Chills or high temperatures (often above 100.4 degrees Fahrenheit or 38 degrees Celsius)
• Nausea or vomiting

Prompt treatment of peritonitis is essential. Call your home training nurse or nephrologist if you have any of the above signs or symptoms of peritonitis.

Treating peritonitis

1. If your effluent is cloudy, mix and add the prescribed antibiotic to your dialysate as directed using sterile technique (see Antibiotics, page 4). Call your home training nurse or nephrologist.
2. Save the first bag of cloudy effluent for cultures. A culture is a laboratory test that tells what kind of germs are in a fluid or tissue sample.
   • If you are coming to the Mayo Clinic Home Dialysis Unit, bring this bag with you. Cultures will be processed by the Home Dialysis Unit.
   • If you are not coming to the Home Dialysis Unit, you need to have cultures processed by both your local laboratory and by Mayo Clinic (see Treating Peritonitis: Collecting effluent samples for culturing, page 9).
3. Until effluent clears (usually within 48 hours):
   • Add 500 units or 1/2 cubic centimeter (cc) of heparin to each continuous ambulatory peritoneal dialysis (CAPD) bag using sterile technique described in the Mayo Clinic publication, Peritoneal Dialysis Problems: Fibrin and Heparin (MC1697-10).
   • Add 1,000 units (1 cc) of heparin to the heater bag for automated peritoneal dialysis (APD).
   • Change the dextrose concentration of your dialysate if your outflow volumes change.
4. If your effluent has not cleared in 48 hours or if other symptoms persist, call your home training nurse or nephrologist for further guidance.

**Emergency supplies**

Always be prepared to treat peritonitis. Whether at home or away, keep these emergency supplies available:

- A peritonitis kit: antibiotics, sterile water, heparin, needles, syringes and iodine swab sticks
- An accidental disconnect kit: iodine swab stick and a catheter clamp
- An extra transfer set

**Hazy or bloody effluent**

The following are not common signs of peritonitis but also may be warning signals of other conditions needing evaluation by your health-care provider. Contact the Home Dialysis Unit if they should occur:

- Hazy effluent (not crystal clear) could be a sign of early peritonitis or that a small amount of red blood cells is in the effluent. A cell count and culture of effluent will help determine the cause.
- Pink, red, rusty or bloody effluent without other symptoms are usually the result of bleeding or irritation in the peritoneal membrane. Refer to the Mayo Clinic publication *Peritoneal Dialysis Problems: Technical and Physical* (MC1697-11), for treatment of bloody effluent.

**Summary**

Peritonitis is a serious infection. You can help prevent it by using sterile technique. Be alert to its signs and symptoms. If your effluent is not clear, begin treatment immediately. Call your home training nurse or nephrologist as soon as possible.
When you complete your peritoneal dialysis training, your nephrologist will give you a prescription for an antibiotic medication and sterile water. Antibiotics are medications that treat infections caused by germs. Different antibiotics treat specific germs. Fill this prescription at the Mayo Pharmacy before leaving Mayo Clinic because your local pharmacy may not carry the specific brand of antibiotic you need. Some generic brands of antibiotics should not be substituted. Be sure to check with your health-care provider before making a generic substitution.

If you get peritonitis, you need to start treating it immediately by adding the prescribed antibiotic to your dialysate. Depending upon the kind of germs found in your effluent culture, your nephrologist may prescribe more specific antibiotics.

Most antibiotics come in a powdered form and need to be mixed with sterile water before they can be used. Check the instructions that come with your medication to learn how to store your medication after it is mixed.

The following instructions describe how to mix and add antibiotics to your dialysate. (One cc (cubic centimeter) is equal to one mL (milliliter).)

**Mixing and adding antibiotics to dialysate**

Supplies for mixing antibiotics
- 1 vial antibiotic: ________________________
- 1 vial sterile water
- 1 sterile 12 cc syringe with attached 20-gauge needle
- 1 iodine swab stick
- 1 sterile 21-gauge needle (purple cap)
- Mask

The number of vials of antibiotic, sterile water and syringes will vary, depending on the type of antibiotic prescribed.

Supplies for adding antibiotic to dialysate bag
- 1 iodine swab stick
- 1 sterile 12 cc syringe with attached 20-gauge needle

Use one syringe for each vial of antibiotic.
1. Prepare your work area:
   - Close windows and doors of your work space.
   - Clean off the work surface.
   - Set out the supplies (see figure 1).
   - Put on a mask and thoroughly wash your hands.

2. Follow these steps for each vial:
   - Remove and throw away the plastic caps
   - Open the iodine swab stick and clean the rubber top of each vial, beginning with the water vials.
   - Wait for **at least three minutes** before using each vial to give the iodine time to kill germs.

Figure 1. Supplies for adding antibiotic to dialysate bag
3. Prepare the syringe or syringes:
   - Tighten the needle on the syringe.
   - With the needle cap still on, draw _____ cc of air into the syringe (see figure 2).

![Figure 2. Prepare syringe](image)

4. Insert the air vent needle:
   - Remove the cap from the 21-gauge needle (purple colored).
   - Insert the needle into the vial of antibiotic just through the rubber top (see figure 3). The air vent needle prevents a build-up of pressure in the vial when the sterile water is added.

![Figure 3. Insert air vent needle](image)
5. Fill the syringe with sterile water:
   - Remove the needle cap without touching the needle.
   - Set the cap carefully on its side.
   - Insert the needle into the vial of sterile water.
   - Push the air into the vial (see figure 4).

- Tip the vial upside down.
- Pull the plunger on the syringe slightly past the amount you need (see figure 5).
- Remove any air bubbles by tapping the syringe and pushing the air back into the vial until you have _____ cc of sterile water in the syringe.
- Remove the needle from the water vial.

Figure 4. Push air into the vial

Figure 5. Fill syringe with sterile water
6. Add sterile water to the antibiotic vial:
   • Place the vial on a flat surface.
   • Insert the needle into the antibiotic vial next to the air vent needle (see figure 6).
   • Push all of the sterile water into the vial.

   Figure 6. Insert needle into antibiotic vial

7. Remove the needle and syringe from the vial. Remove the air vent needle. Place used needle(s) in a covered, puncture-resistant container before placing in the trash.

8. Tip the vial upside down over and over. Avoid touching the top of the vial. The solution should look clear. It should not contain any particles of powder.

9. Repeat steps 4 through 8 for each vial of antibiotic.
1. Clean the injection port of the dialysate bag and the rubber tops of each vial of antibiotic with a new iodine swab stick. **Wait 3 minutes.**

2. Prepare the syringe:
   - Tighten the needle on the new syringe.
   - Draw _________ cc of air into the syringe.
   - Remove the needle cap and insert the needle into the vial.
   - Push in the air and draw back _________ cc of antibiotic into the syringe, keeping the tip of the needle in the solution.
   - Remove air bubbles from the syringe so you have the correct dose.

3. Add antibiotic to the dialysate bag:
   - Place the vial on a flat surface.
   - Remove the needle and syringe.
   - Insert the needle into the injection port of the dialysate bag.
   - Inject the antibiotic into the bag.
   - Remove the needle and syringe and place in a closed, puncture-resistant container before placing in the trash.

4. Follow the above procedures for the remaining vials. **Swab the injection port after each injection.**

5. Follow the instructions for the appropriate dwell time for each antibiotic or medication.

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**Procedure for adding antibiotics to the dialysate bag**

When treating peritonitis at home, you need to have your effluent cultured before you add antibiotics. Two samples need to be collected. These samples must be taken from the first bag of cloudy effluent.

- Send one effluent sample to Mayo Clinic. Follow the instructions given in the section of this chapter titled: *How to collect an effluent sample for mailing to Mayo Clinic*, page 10. (If you are unable to collect a sample, ask your local laboratory to remove a sample from the cloudy bag and send it to Mayo Clinic for you. Take a culture tube and mailer (available from your Mayo Clinic nurse) to the laboratory where you will have your samples processed.
- A second sample needs to be tested at your local laboratory. The easiest and best way for the local laboratory to obtain an effluent sample is directly from the bag of effluent itself. Take the bag and a copy of the attached letter with specific information (a copy is also located in your manual) to the lab after you have removed a sample to be sent to Mayo Clinic. The laboratory at Mayo Clinic will test the effluent immediately and provide the results to the Home Dialysis Unit. This will reduce the time it takes to identify the type of germ causing the peritonitis and determine the most effective antibiotic to treat it.
The local laboratory should perform the following tests on the effluent:
- White blood cell count with differential
- Gram stain
- Bacteria and fungus culture
- Sensitivities

An effluent bag does not have an injection port. To get a sample of effluent, you must first transfer the effluent to the just-emptied dialysate bag that has an injection port. Your nurse will show you how to do this and allow you to practice.
1. Complete the exchange.
2. Clamp the short segment of the Y-tubing with the outlet port clamp; then disconnect the Y-tubing from the transfer set as usual.
3. Hang the bag of effluent on the intravenous (IV) pole and place the just-emptied dialysate bag on the floor. Gravity will drain the effluent into the bag when you open the drain and fill clamps. Leave the outlet port clamp on the Y-tubing in place.
4. Collect the effluent samples from this bag.

How to collect an effluent sample for mailing to Mayo Clinic

Supplies
- The first bag of cloudy effluent, freshly drained, transferred into a dialysate bag
- 1 iodine swab stick
- 1 sterile 12 cc syringe and 20-gauge needle
- 1 culture mailing kit with sterile culture tube
- Tape

Procedure for drawing a sample of effluent for CAPD
1. Place the effluent bag on a clean surface.
2. Put on your mask and thoroughly wash your hands for one minute. If someone is helping you, that person should put on gloves after washing his or her hands.
3. Clean the injection port on the effluent bag with an iodine swab stick. Wait three minutes.
4. Using sterile technique, tighten the needle on the syringe.
5. Remove the needle cap and insert the needle into the injection port. Slowly withdraw 10 cc of effluent (see figure 7). Recap the needle carefully.
Procedure for drawing a sample of effluent from the cycler in APD
Your nurse will show you how to do this and allow you to practice.
1. The cycler must be in drain mode to draw the sample.
2. Press the button marked stop to stop drain.
3. Using your 12 cc syringe, remove (but save) the needle, and attach the syringe to the sample port. Open the clamp. Press the button marked go.
4. Draw 10 cc of effluent into the syringe.
5. Close the clamp.
6. Disconnect the syringe from the sample port and reconnect the needle.
7. Replace the blue cap on the sample port and clamp.
Preparing the sample for mailing for both CAPD and APD

1. Remove the culture tube from the culture mailing kit. Remove the cap from the tube. Be careful not to touch the top of the tube or the inside of the cap. Set the cap down, sterile-side-up (inside facing up). Place the culture tube, open-end-up, in the mailer top.

2. Remove the needle cap using sterile technique. Place the needle tip in the opening of the culture tube. Push on the plunger to place the sample into the culture tube (see figure 8). Discard the syringe and needle in a puncture-resistant container.

3. Without touching the inside the culture tube, replace the cap on the culture tube.

4. Write your name and Mayo Clinic number on the small label from the culture mailing kit and affix it to the culture tube.

5. Tape the cap onto the culture tube, place it into a plastic bag and seal the bag to prevent leaks.

6. Place padding around the bag and place it in the mailing container.

7. Affix the mailing address label to the outside of the mailing container. Mail immediately to ensure delivery in one to two days. First class mail, UPS or overnight mail may be needed.

Figure 8. Place the sample into the culture tube
BARBARA WOODWARD LIPS PATIENT EDUCATION CENTER

Mrs. Lips, a resident of San Antonio, Texas, was a loyal patient of Mayo Clinic for more than 40 years. She was a self-made business leader who significantly expanded her family’s activities in oil, gas and ranching, even as she assembled a museum-quality collection of antiques and fine art. She was best known by Mayo staff for her patient advocacy and support.

Upon her death in 1995, Mrs. Lips paid the ultimate compliment by leaving her entire estate to Mayo Clinic. Mrs. Lips had a profound appreciation for the care she received at Mayo Clinic. By naming the Barbara Woodward Lips Patient Education Center, Mayo honors her generosity, her love of learning, her belief in patient empowerment and her dedication to high-quality care.