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Infections of the Urinary System

CLINICAL CASE STUDY #1 - Infections of the Urinary System

The Patient:
Name: Polly Pocket
Sex: Female
Age: 22-years old

1st doctor's visit

Search

Take Care of Your Kidneys

A female 22-year old patient named Polly Pocket was seen at Holly Hospital complaining of a burning feeling when during urination and feeling like she had the intense urge to urinate frequently.

The doctor explained that the symptoms of a urinary tract infection (UTI) or bladder infection may include the following:

- Pain or burning during urination
- The frequent urge to urinate
- Pain in the lower abdomen
- Cloudy or foul-smelling urine

The doctor ordered a urinalysis test to test for the presence of leukocytes (or white blood cells). When the body notices that there are bacteria cells in the urinary tract, the body's immune system will launch an attack against the bacteria. The immune system combats that bacteria by releasing white blood cells that will travel to the location and try to kill the invading bacteria.

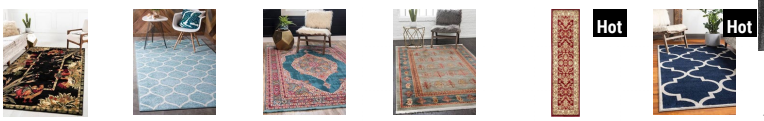
Diagnosis and Treatment

The patient test positive for leukocytes and was placed on 7-day regimen of oral ampicillin (an antibiotic). The patient's symptoms subsided after 3 days of using the antibiotic, so she stopped taking them. She threw away the remaining pills.

2nd Doctor's Visit

3 weeks later, Polly came into the doctor's office complaining of feeling nauseated, but she was not actually vomiting. She also noticed pain in her lower back, around the left flank area. The patient reported that over the last 2 days, she had been experiencing chills and was urinating more often. The nurse found

that the patient was also running a fever of 38.8°C (,37.0°C is normal). The doctor order a urinalysis.

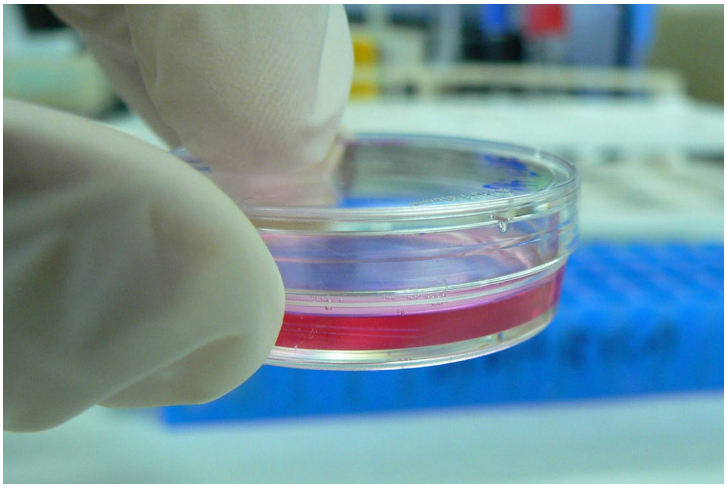


TEST RESULTS

Urinalysis showed

- >50 white blood cells per high-power field.
- 3 to 10 red blood cells per high-power field.
- 3+ bacteria.

Urine culture was subsequently positive for >105 CFU of an organism per ml (seen growing on culture in Fig. 1.1 [sheep blood agar] and Fig. 1.2 [MacConkey agar]). Note that the organism is beta-hemolytic.



TEST INTERPRETATIONS

Rugs.com

Normal Urinalysis Values are as Follows:

- Color – Yellow (light/pale to dark/deep amber)
- Clarity/turbidity – Clear or cloudy
- pH – 4.5-8
- Specific gravity – 1.005-1.025
- Glucose - ≤130 mg/d
- Ketones – None
- Nitrites – Negative
- Leukocyte esterase – Negative
- Bilirubin – Negative
- Urobilirubin – Small amount (0.5-1 mg/dL)
- Blood - ≤3 RBCs
- Protein - ≤150 mg/d
- RBCs - ≤2 RBCs/hpf
- WBCs - ≤2-5 WBCs/hpf
- Squamous epithelial cells - ≤15-20 squamous epithelial cells/hpf
- Casts – 0-5 hyaline casts/lpf
- Crystals – Occasionally
- Bacteria – None
- Yeast - None

WBC's

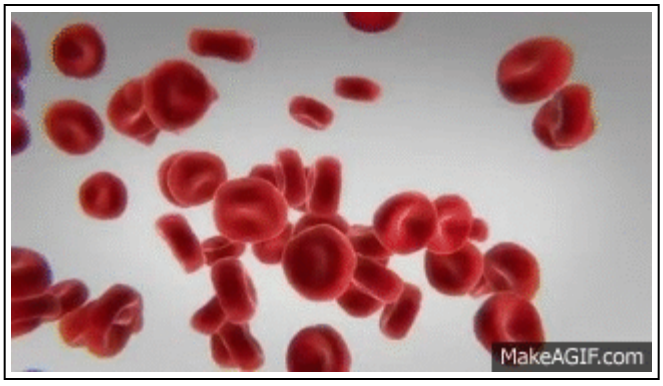
- The urinalysis showed >50 white blood cells per high-power field, which is much higher than the normal level of white blood cells- (normal WBCs counts are ≤2-5 WBCs/hpf). When the number of WBCs in the urine increases, this typically indicates that the patient has a urinary tract infection (UTI).
- CONCLUSION = Bacterial infection occurring somewhere in the urinary system. Location can be urethra, bladder or kidney.

CELL CULTURE

- The cell culture revealed more than 105 coloby-forming units (CFUs).. The presence of more than 105 CFus indicates a high-level of bacteria are present in the urine. Urine cultures from patients experiencing symptoms of a UTI usually show >105 CFU/mL of urine.
- Asymptomatic patients whose cultures have been contaminated usually show < 103 CFU/mL of urine.
- CONCLUSION = Bacterial infection occurring somewhere in the urinary system is now confirmed.

RBC's

- The normal amount of red blood cells in a urine sample should not exceed 2 red blood cells per high-powered field (normal = ≤2 RBCs/hpf). When more than 3 RBCs are present, this indicates the presence of blood in the urine. The presence of blood in the urine can indicate one of the following conditions:
    - Bladder infection (also called acute cystitis), which typically causes burning or pain with urination
    - Kidney infection (also called pyelonephritis)
    - Kidney stones, which usually present with one-sided back or flank pain that can be severe



- CONCLUSION = Bacterial infection occurring somewhere in the urinary system. Location can be urethra, bladder or kidney. However, the patient is experiencing symptoms of a kidney infection. LOCATION OF INFECTION IS MOST LIKELY THE KIDNEY.

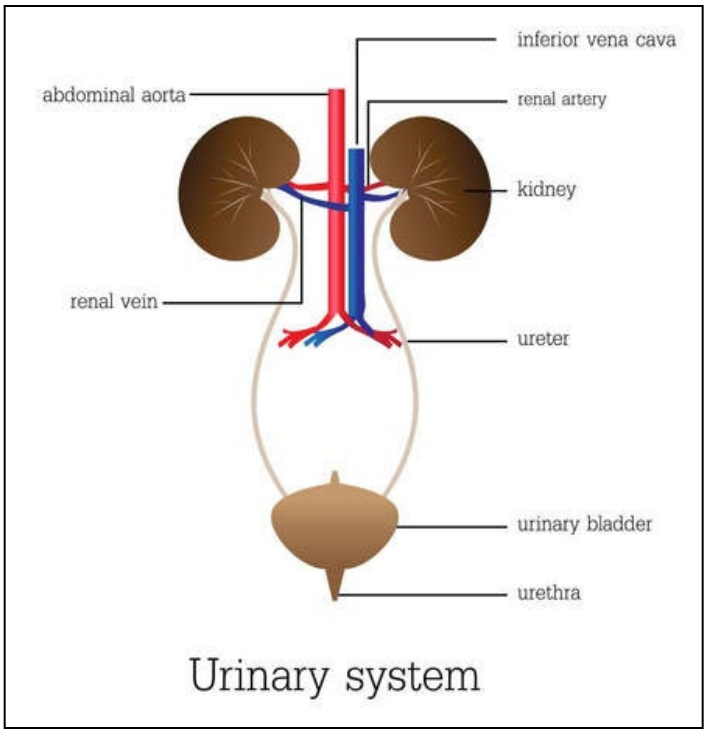
Pyelonephritis can be treated with either oral or intravenous antibiotics, including penicillins, cephalosporins, vancomycin, fluoroquinolones, carbapenems, and aminoglycosides.

Cystitis is usually caused by a bacterial infection of the bladder. Common symptoms of cystitis include

- dysuria (urination accompanied by burning, discomfort, or pain),
- pyuria (pus in the urine),
- hematuria (blood in the urine), and bladder pain.

Gross Examination of Urine Color- INDICATORS

IF THE URINE APPEARS RED: Medical conditions – Urinary tract infections (UTIs), nephrolithiasis, hemoglobinuria (rhabdomyolysis), porphyrias (urine color, port wine)



IF THE URINE APPEARS BLUE: Medical condition – Blue diaper syndrome (also known as tryptophan malabsorption)

IF THE URINE APPEARS GREEN: Medical conditions – Urinary tract infections (UTIs),

IF THE URINE APPEARS PURPLE: Medical condition – Bacteriuria in patients with urinary catheters (purple urine bag syndrome)

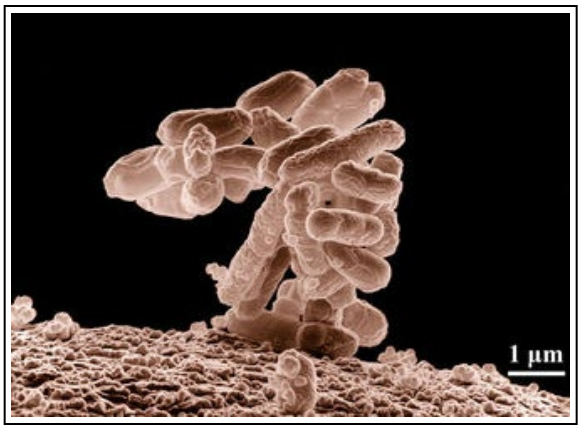
IF THE URINE APPEARS BROWN: Medical conditions – Gilbert syndrome, tyrosinemia,

hepatobiliary disease

IF THE URINE APPEARS BLACK: Medical conditions – Alkaptonuria, malignant melanoma

IF THE URINE APPEARS WHITE: Medical conditions – Chyluria, pyuria, phosphate crystals

Bladder infections are more common in women than men. This is because the urethra in women is short and kinked. The urethral opening in females is also in close proximity to the anus which carries fecal bacteria. Bladder infections occur more often in people that have weak immune systems or a weak bladder that does not completely empty its contents upon urination. For example, men can develop a condition known as prostatitis which can cause incomplete bladder drainage which increases the risk of infections. Also, the presence of kidney stones, which can develop in either men or women, can result in blocking the passage of urine, leading to improper bladder drainage and increased risk of infection.



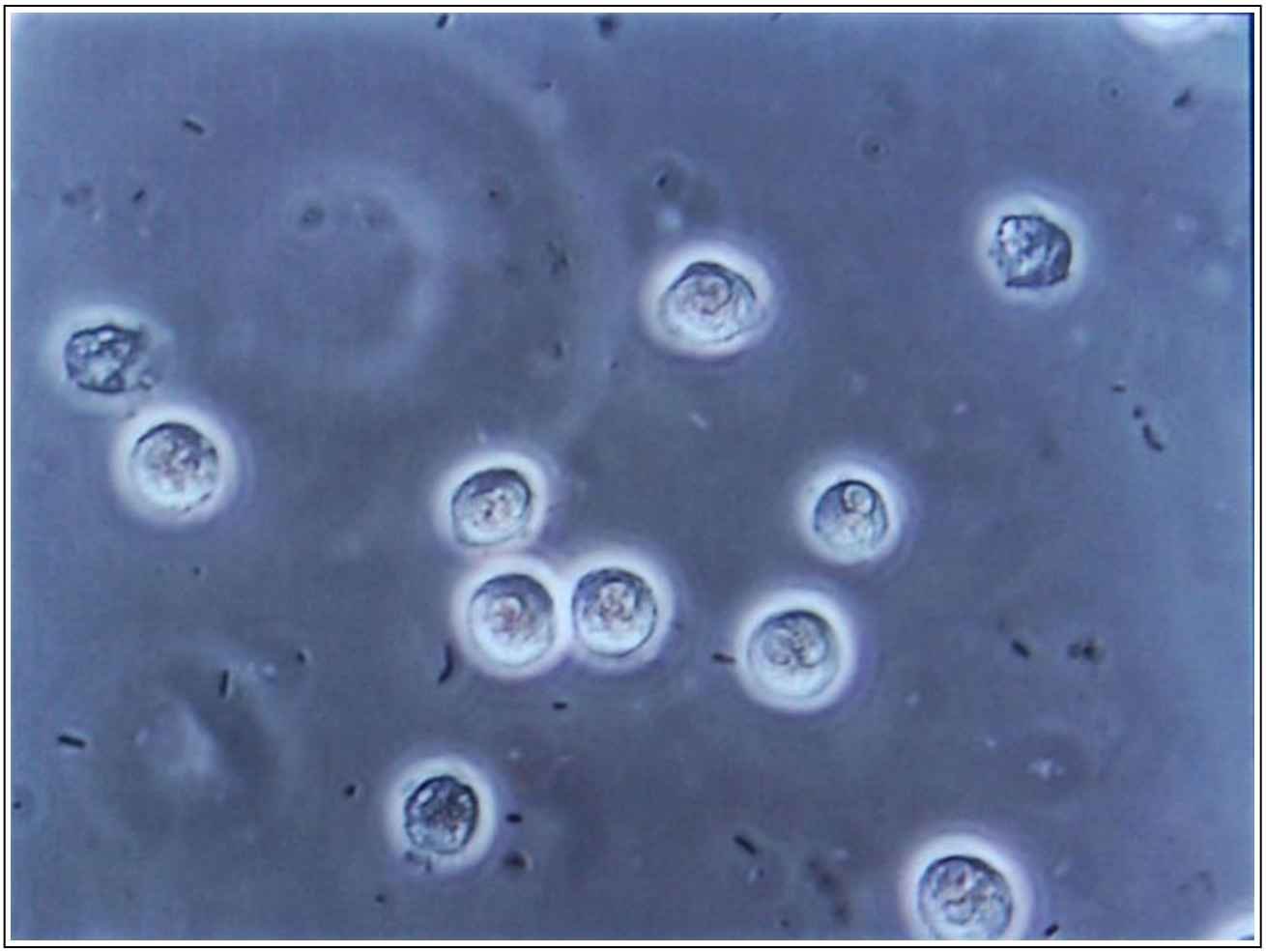
E. Coli bacteria - a common cause of UTI

Most bladder infections are caused by Gram-negative bacteria including Escherichia coli (most common), Proteus vulgaris, Pseudomonas aeruginosa, and Klebsiella pneumoniae. However, some gram-positive bacteria including coagulase-negative Staphylococcus saprophyticus, Enterococcus faecalis, and Streptococcus agalactiae, have also been known to cause infections of the badder.

Diagnosis involves testing urine for the presence of nitrites, leukocyte esterase, protein, or blood, which indicate the presence of bacteria in the urinary tract.

- The presence of nitrite may indicate the presence of E. coli or K. pneumonia; these bacteria produce nitrate reductase, which converts nitrate to nitrite.
- The leukocyte esterase (LE) test detects the presence of neutrophils as an indication of active infection.

Urinalysis may not be enough to confirm the presence of a urinary tract



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infection. This is because the tests used in urinalysis are not very sensitive or specific. For this reason, urinalysis is often done in addition to a cell culture. The results of the cell culture takes a couple or days, however, whereas the urinalysis can usually be done right away. So, the urinalysis is usually done immediately to provide the patient with a preliminary diagnosis so that an appropriate antibiotic may be prescribed.

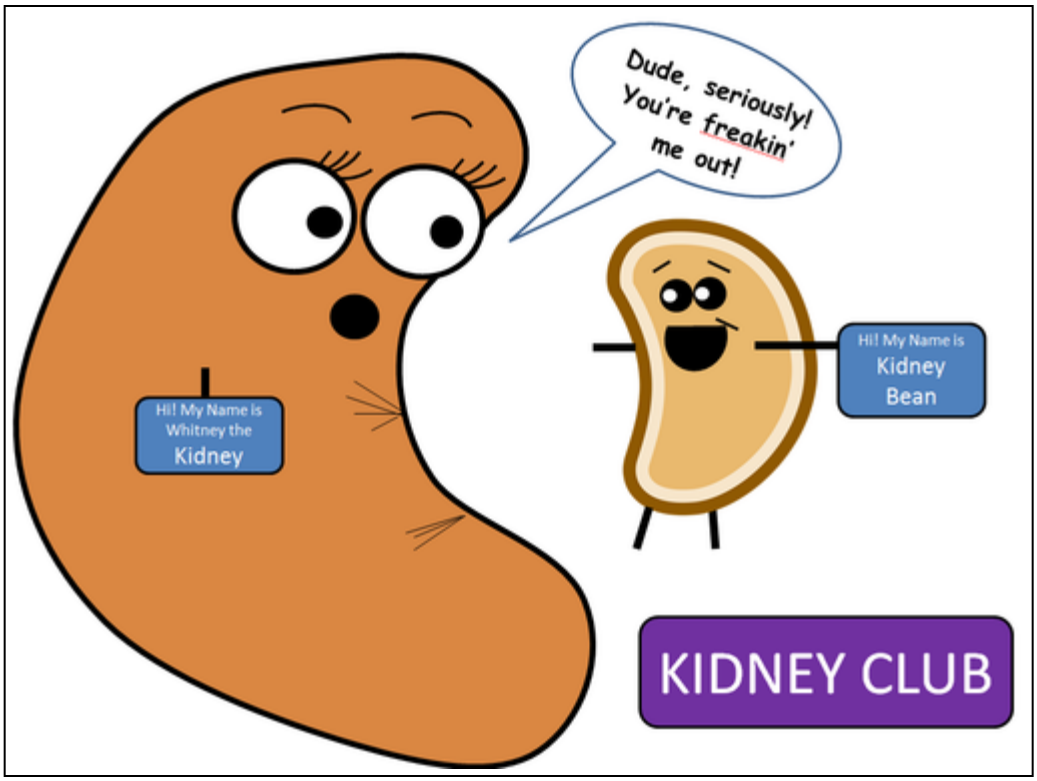
A **urine culture** is a test to confirm the presence bacteria in the urinary tract, as well as to diagnose the type of bacteria present. This is because different bacteria respond in different ways to different antibiotics. The cell culture is grown on blood agar and MacConkey agar.

TREATMENT

Bacterial infections of the bladder can be treated using one of the following antibiotics:

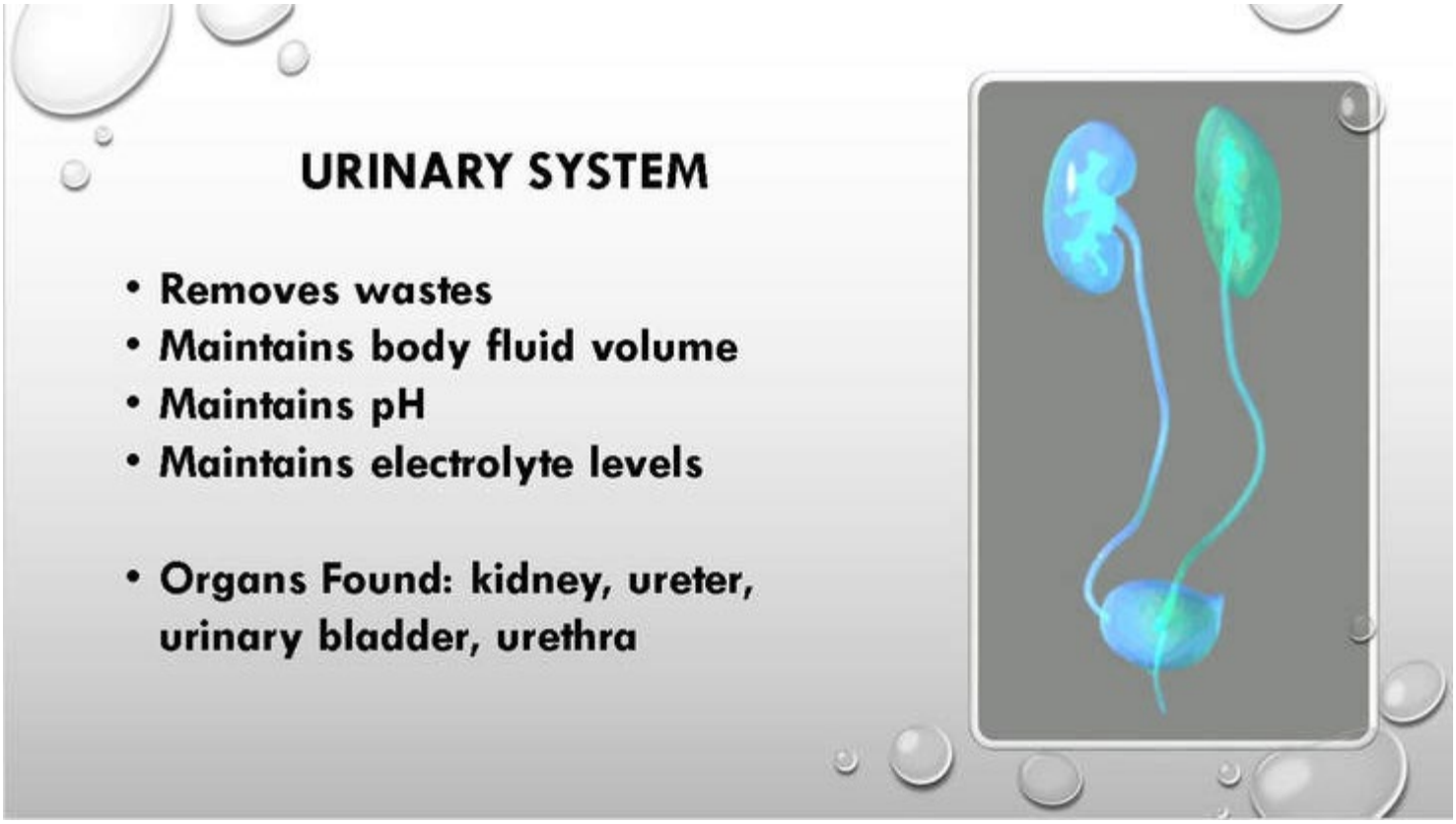
- fluoroquinolones (Cipro)
- nitrofurantoin (Macrobid)

- cephalosporins (e.g. Keflex)
- or a combination of trimethoprim and sulfamethoxazole (Bactrim)



KIDNEY INFECTION?? The kidneys are also part of the urinary tract. A urinary tract infection will begin in the lower portions of the urinary tract, like the bladder or urethra. However, if left untreated, or incompletely treated, the bacteria can spread to the kidneys. Kidney infections cause a condition called pyelonephritis, which is an inflammation of the kidney. Infection of the kidneys is more more severe than infections of the bladder or urethra. The patient may experience back pain, fever, and nausea (with or without vomiting). From the kidney, the bacterial infection can spread to the blood stream becoming life-threatening.

PREVENTION



- Empty your bladder frequently as soon as you feel the need to go; don't rush, and be sure you've emptied your bladder completely.
- Wipe from front to back.
- Drink lots of water.
- Choose showers over baths.
- Stay away from feminine hygiene sprays, scented douches, and scented bath products -- they'll only increase irritation.
- Cleanse your genital area before sex.
- Urinate after sex to flush away any bacteria that may have entered your urethra.
- If you use a diaphragm, unlubricated condoms, or spermicidal jelly for birth control, consider switching to another method. Diaphragms can increase bacteria growth, while unlubricated condoms and spermicides can cause irritation. All can make UTI symptoms more likely.
- Keep your genital area dry by wearing cotton underwear and loose-fitting clothes. Avoid tight jeans and nylon underwear -- they can trap moisture, creating the perfect environment for bacteria growth.

FREQUENT Urinary Tract Infections

If you have 3 or more UTIs a year, ask your doctor to recommend

a special treatment plan. Some treatment options include:

- Taking a low dose of an antibiotic over a longer period to help prevent repeat infections
- Taking a single dose of an antibiotic after intercourse, which is a common infection trigger for infections.
- Taking antibiotics for 1 or 2 days every time symptoms appear
- Using an at-home test using an over-the-counter kit immediately upon the presence of symptoms. These tests are low-cost and available at most pharmacies without a prescription.
- Contact your doctor if the test is positive. If your symptoms persist or are bothersome, see your doctor for further testing.

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