

Vaginal infections: an overview

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CEU

Sept. 2005

Learning objectives

Upon successful completion of this lesson, you should be able to:

1. discuss the pathophysiology of vaginitis and the three most commonly encountered vaginal infections in the community pharmacy setting—yeast infections, trichomonas and bacterial vaginosis.
2. describe the factors that increase the risk for vaginal infections.
3. discuss the treatment and prevention of vaginal infections.
4. list some of the fallacies surrounding vaginal infections.
5. be better prepared to assist clients with vaginal infections.

To successfully complete the post-test for this lesson, you may need access to the Compendium of Pharmaceuticals and Specialties (CPS).

Introduction

Vaginal infections are the number one reason for adult women to see their healthcare providers.¹ In North America, these infections account for more than 10 million visits to physicians' offices each year.¹ In 2003, Canadian pharmacy sales of nonprescription vaginal yeast infection products were \$23.6 million and pharmacists made an average of nine recommendations per month of these products.¹

Vaginitis is an inflammation of the vagina that may be caused by an infection. The two most common vaginal infections are yeast infections (*monilia* or *candida*) and bacterial vaginosis. Vaginal yeast infections are common among women, with about 75 per cent being affected during their lifetime and 40 to 50 per cent having recurrent episodes.² In one study,

6.5 per cent of women reported that they had had at least one episode of a vaginal yeast infection during the previous two months.³

Bacterial vaginosis is the most prevalent cause of vaginal discharge or malodour, although up to 50 to 60 per cent of women can be asymptomatic. Bacterial vaginosis is reported in anywhere from 10 per cent to 41 per cent of women, depending upon the group of women studied.⁴

This lesson will explain the pathophysiology and treatment options for vaginal infections. These are both key to effective counselling for community pharmacists.

Normal vaginal physiology

The vagina is the musculomembranous organ that moves internally to the reproductive organs. The vagina and vulva comprise the

lower genital tract and the uterus, ovaries and fallopian tubes comprise the upper genital tract. The cervix connects the two areas.

The vagina is positioned at a 45-degree angle with the small of the back. The mucosal lining of the vagina lies in folds that extend and unfold as the vagina is stretched. This capacity to expand is important during childbirth and intercourse.

The average healthy adult vaginal tract has four characteristics:⁵

- The pH of the normal vagina from puberty to menopause is slightly acidic, ranging from a pH of 4.5 to 5.5. The presence of *Lactobacillus* keeps the pH normal, preventing overgrowth of bacteria and yeast. A change from the normal pH of the tract generally leaves the structures susceptible to infection. This alteration in pH may be the result of physical, chemical, mechanical or allergic imbalance or the influence of a tumour. Menstrual blood, certain infections or semen often make the vaginal pH alkaline.
- The vagina has a variably thick, protective epithelium comprised of squamous epithelial cells.
- The thickness of the squamous cells is hormonally responsive. The vaginal epithelium responds to both estrogen and progesterone. As ovulation approaches and estrogen levels increase, an increased sloughing of the cells occurs. On occasion this will form a cloudy, pasty discharge. When progesterone begins its production and estrogen levels are low, there are fewer superficial cells. The vaginal

Instructions

1. After carefully reading this lesson, study each question and select the one answer you believe to be correct. Circle the appropriate letter on the attached reply card.
2. Indicate if you are already registered as an annual CE Club Member or if you would like to become a member.
3. Complete the card, and mail or fax to (416) 764-3937.
4. Your reply card will be marked and you will be advised of your results within six to eight weeks in a letter from *Pharmacy Practice*.
5. To pass this lesson, a grade of 70 per cent (14 out of 20) is required. If you pass, your CEU(s) will be recorded with the relevant provincial authority(ies). (Note: some provinces require individual pharmacists to notify them.)

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epithelium is constantly being replenished, known as vaginal cleansing. When levels of estrogen are low, for example, after menopause, the vaginal mucosa is thinnest and most vulnerable to infection.

- The vagina has a bacterial flora that is integral to maintaining the normal level of acidity. The acid is produced from the breakdown of glycogen (found in epithelial cells) to lactic acid by the bacterial flora. The normal flora usually consists of *Lactobacillus*, *Staphylococcus*, diphtheroids, bacteroids, *peptococci* and *peptostreptococci*. The normal flora may contain a wide variety of anaerobic as well as aerobic bacteria, any of which may become pathogenic.

The vagina will have a degree of vaginal discharge even under normal conditions. This fluid is due to mucous secretions, which exude through the wall and from Bartholin glands found in vaginal walls. Normal vaginal discharge is generally acidic, odourless, non-bloody and colourless. It is not associated with pruritis. The discharge, occurring before ovulation, originates in the cervix and is alkaline in its nature.⁵

A bloody, watery discharge may be suggestive of a malignancy. Other noninfectious causes of bloody discharge include cervical polyps, especially after intercourse, and vaginal atrophy. Vaginal infections will cause various kinds of abnormal vaginal discharge. It is often possible to distinguish between the vaginal infections based on the characteristics of the abnormal vaginal discharge.

Vaginitis not attributable to infections

Vaginitis refers to an inflammation of the vagina. The symptoms are an increased vaginal discharge, vulvar irritation and/or pruritis, external dysuria (pain upon urination) and, sometimes, odour. Vaginitis can often be caused by infections (e.g., abnormal flora such as trichomonas, a quantitative increase in the normal flora such as *Candida*, *G. vaginalis* and anaerobes, or other infections such as herpes

simplex type 2).

Vulvitis, which refers to an inflammation of the external genitalia, usually occurs secondary to vaginal infections.⁵ However, in children and postmenopausal women, vulvitis may occur on its own, and may be related to skin disorders, tumours or allergic reactions. For acute vulvitis that is not associated with a vaginal infection, the cause needs to be sought and eliminated. Irritation can be reduced by measures such as wearing loose, absorbent undergarments and keeping the vulva clean. Intermittent use of ice packs or warm sitz baths also reduce irritation. Oral antihistamines reduce itching but can cause drowsiness.

Causes of vaginitis and/or vulvitis that are not related to infection include:

- **Allergies:** Vaginitis can be an allergic or irritant reaction to the following products: latex (e.g., latex condoms), vaginal contraceptives, spermicides, ingredients in products such as scented soaps, deodorizing pads or hygiene sprays, and douches. These reactions may not all be allergic ones, but rather due to local irritation. Laundry soaps, bleaches, fabric softeners, fabric dyes, synthetic fibres and toilet tissue can also cause irritation.
- **Clothing:** Tight, nonporous underclothing fosters fungal and bacteria growth; however, local irritation may also result.
- **Foreign objects** may cause vaginitis. The most common is a retained tampon; however, other objects erroneously or purposely inserted into the vagina may result in inflammation.
- **Menopause:** With menopause, either natural or due to an oophorectomy, vaginal atrophy may occur as the result of estrogen deficiency. In these women, discharge is scant and alkaline. The vaginal tissue is less resilient and vaginitis unrelated to infections can occur. Atrophic vaginitis refers to irritation without infection; however, infection may also occur. Estrogen supplementation

restores the integrity of the vaginal mucosa but it also increases colonization by yeast and hence the potential for yeast infections.

- **Sexual abuse** may be suspected when vaginitis occurs in young girls. Community pharmacists must be aware of this possibility, especially when a nonprescription vaginal product is being sought for relief of vaginal symptoms in a young girl. Symptoms of pinworm infections are sometimes confused with the symptoms of vaginitis, and care is needed to differentiate these infections. Age can be an important factor. In newborns, a sterile mucous discharge may be the result of maternal estrogen. This discharge subsides after about two weeks. In girls, inflammation of the vulva may be due to *Escherichia coli* infections and poor hygiene. If *Neisseria gonorrhoeae* is evident, sexual activity or abuse is confirmed.⁶
- **Poor hygiene** can lead to chronic vaginitis and vulvitis. Women who are overweight, incontinent or bedridden may have difficulty maintaining good personal hygiene. Women confined to bed, at any age, have an increased incidence of bacterial vaginosis.⁴
- **Chronic skin disorders**, such as psoriasis and tinea versicolor, can affect the vulva and should be treated appropriately.⁵

Vaginal infections

The most commonly encountered vaginal infections are yeast, trichomonas and bacterial vaginosis infections (see Table 1 for the parameters for diagnosis). Vaginal infections may also be attributed to other causative organisms. Herpes simplex type 2 and human papillomavirus account for common viral infections of the vagina. However, these are beyond the scope of this lesson, as are sexually transmitted infections (STIs—formerly STDs [sexually transmitted diseases]) such as chlamydia, gonorrhea and syphilis. If vaginal symptoms do not respond to treatment, these infections may be present and a referral to a physician or health clinic is needed.

CE Faculty

This month

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Reviewers

All lessons are reviewed by three pharmacists for accuracy, currency and relevance to current pharmacy practice.

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This lesson has been approved for 1 CE unit by the Canadian Council on Continuing Education in Pharmacy. CCCEP file # 287-0605 Approved for 1 CEUs by l'Ordre des pharmaciens du Québec.

This lesson is published by Rogers Publishing Limited, One Mount Pleasant Rd., Toronto, ON M4Y 2Y5. **Editorial office:** Tel: (416) 764-3916 Fax: (416) 764-3931. **CE queries:** Tel: (416) 764-3879 Fax: (416) 764-3937 mayra.ramos@rci.rogers.com.

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TABLE 1 Parameters in diagnosis of vaginal infections*

Parameter	Yeast infection	Trichomonas	Bacterial vaginosis
Discharge	Thick, white, "cottage cheese" discharge	Profuse frothy, yellowish-green discharge	Grey, homogeneous discharge
Erythema	Yes—edema and excoriation can be common	Yes—inflammation can be acute with the cervix and vagina having a strawberry appearance	No
Pruritus	Yes—burning, irritation, which increases with intercourse, sometimes called "the itch"	Yes—itching and irritation	Yes—slight irritation
Odour	No	Yes—a "fishy" odour because of co-existing anaerobic organisms	Yes—a "fishy" odour that becomes more pronounced when discharge is more alkaline, e.g., after intercourse or menstruation
Microscopic evaluation	Budding yeast cells	Motile, flagellated protozoa	Clue cells (epithelial cells that are used in diagnosis)
pH	<4.5	5-6	>4.5

* adapted from references 1,7,8

TABLE 2 Relevant questions in diagnosis of vaginal infections*

- What are your symptoms? Discharge? Odour? Irritation?
- Is this a recurrent infection? How often? When does it occur in relation to your menstrual cycle?
- If this is a recurrent infection, was it diagnosed by your physician? How have you treated it previously and how did it respond?
- What medical conditions do you have? Are you pregnant? What medications do you take?
- If you are sexually active, what contraceptive do you use? Do you experience postcoital irritation? Have you ever had a sexually transmitted disease?
- Do you have pain when you urinate? Are lesions present?
- What feminine hygiene products do you use?
- Have you recently changed laundry products, bath products or type of undergarments?

* adapted from reference 9

Yeast or Candida infections

Fungal or yeast infections account for 30 to 35 per cent of vaginal infections. Yeast colonizes 15 to 20 per cent of nonpregnant women and 20 to 40 per cent of pregnant women.⁷

With a yeast or *Candida* infection there is intense vulvar and vaginal itching. There can also be external dysuria that is painful and difficult. The vulvar signs include edema, erythema and, in severe cases, fissures. The vagina itself is dry, bright red in colour, and mottled with white curdy plaques.⁷

These signs and symptoms may not be reported by the women suffering from a yeast infection. Rather, they will describe their symptoms as "an itch," "irritation" or "pain when urinating." Some women may have little discharge and redness.

Candida albicans causes 90 per cent of yeast infections.⁵ Other yeast species cause the remainder of the infections. Normally, these yeasts can be isolated from 15 to 25 per cent of women; thus, it is not the presence of

the yeast that leads to these infections, but the overgrowth of yeast.⁵ With overgrowth, host resistance and local bacterial flora change, and the yeast infection results.⁵

Any one of a number of conditions make women more susceptible to yeast infections:

- In pregnancy, there can be a decrease in cellular immunity and increased levels of urine glucose, both of which contribute to yeast overgrowth.⁵
- In diabetes, there are increased levels of urine glucose, which provide yeast with more nutrients, resulting in proliferation. Women who have recurrent yeast infections should be tested for undiagnosed diabetes mellitus.⁵
- Immunosuppressed states can increase the incidence of yeast infections. Some medications (e.g., cancer chemotherapy, corticosteroids) have the ability to suppress the immune system, as do disease conditions such as HIV and AIDS. With immunosuppression, there is decreased cellular immu-

nity and yeast can proliferate.⁵

- Broad-spectrum antibiotics (e.g., tetracycline) suppress the normal flora of the gastrointestinal and genitourinary tract, permitting overgrowth.⁵
- Oral contraceptives can contain high levels of estrogen, which promotes yeast growth. This effect is most notable within the first three months of use.⁵
- The use of an intrauterine device (IUD) increases the risk for yeast infection; the reasons for this are unknown.⁵

Diagnosis: Yeast infections are diagnosed by microscopic examination of a vaginal swab. Yeast cells are seen as budding groups of cells. Examination using a 10 per cent solution of potassium hydroxide (KOH) testing is more reliable in diagnosing yeast infections. The potassium hydroxide dissolves the skin cells, allowing for easier visualization.⁵

Table 2 illustrates relevant questions to ask women when attempting to determine the best course of action for that individual.

Treatment: The imidazole antifungals are the drugs of choice to treat vaginal yeast infections and can be used topically as well as orally. Seven-, six- and three-day dosing regimes are more effective, however one-dose regimens can increase compliance. Frequent episodes may require long-term suppression with oral drugs.⁵

Yeast infections are not considered to be sexually transmitted; however, a male partner may act as a reservoir for recurrent infections and in 12 to 15 per cent of male partners, symptoms such as rash and itch are seen.⁵ Approximately 50 per cent of the population carry *Candida* in the mouth; thus, oral sex can transmit yeast infections. Sex between female partners can also transmit these infections.⁵

See below for a more detailed discussion of pharmacological treatment of vaginal infections.

Trichomonas infections

Trichomonas infections account for five to 10 per cent of vaginal infections.⁸ *Trichomonas vaginalis*, an anaerobic protozoan, is the causative organism. The organism is present in three to 15 per cent of women.⁶

More than 50 per cent of women who are infected with trichomonas are asymptomatic.⁸ The symptoms, if they occur, are a profuse and malodorous discharge that is uncomfortable and sometimes frothy. This vaginal discharge is evident in about one-third of infections.⁶ There is also internal and external dysuria. The vulvar or external itching can be severe. Acute inflammation may cause the cervix and vagina to have a strawberry-red appearance. Often these symptoms appear after menstruation.

Diagnosis: Trichomonas is diagnosed by microscopic examination of a vaginal swab for the characteristic flagellated protozoa, which

TABLE 3 Drugs used to treat vaginal infections¹²

Drug	Type	Dosage range
Clotrimazole , as a topical imidazole, a drug of choice for vaginal yeast infections (nonprescription)	Topical cream or vaginal insert/cream	1% cream daily for 7-14 days; 100 mg insert daily for 7 days or twice daily for 3 days; 500 mg insert once
Miconazole , as a topical imidazole, a drug of choice for vaginal yeast infections (nonprescription)	Topical cream or vaginal insert/cream	2% cream daily for 7 days; 100 mg insert daily for 7 days; 200 mg insert daily for 3 days; 1200 mg insert once
Nystatin Only preparations for topical use on the skin are nonprescription	Vaginal insert/cream	100,000 IU once daily for 14 days
Terconazole , as a topical imidazole, a drug of choice for vaginal yeast infections	Topical cream or vaginal insert/cream	0.4% cream daily for 7 days; 0.8% cream daily for 5 days; 80 mg insert daily for 3 days
Fluconazole , a drug of choice for vaginal yeast infections (ease of use increases compliance)	Oral	150 mg as a single dose
Metronidazole , a drug of choice for trichomonas and bacterial vaginosis	Oral/vaginal gel	For trichomonas: 2 g once or 500 mg orally bid for 7 days; For bacterial vaginosis: 500 mg bid x 7 days; 2 g once; or 0.75% gel bid for 5 days
Ketoconazole , a second-line therapy for vaginal yeast infections	Oral	400 mg twice daily for 5 days
Clindamycin , a drug of choice for bacterial vaginosis	Oral/vaginal cream/ovules	300 mg bid for 7 days; 2% cream od for 3 to 7 days; 100 mg ovule od for 3 days

are often motile. The organism is found in 20 to 50 per cent of women attending clinics for sexually transmitted infections,⁸ but it is unclear whether it is the lifestyle or the infection that accounts for this incidence.

Women diagnosed with trichomonas should also be tested for gonorrhoea, since about 60 per cent of women with gonorrhoea have trichomonas, and the gonorrhoea is often asymptomatic.⁶

Treatment: Because trichomonas can infect not only the vagina, but also the urethra, bladder and Skene's glands, systemic treatment is required. Metronidazole 2 g in one oral dose is the treatment of choice for both partners, and it has a 95 per cent cure rate.⁶ Metronidazole 500 mg orally twice daily for seven days is an alternative and effective dosing regime; however, it has a lower compliance rate.⁶

Trichomonas is a sexually transmitted infection, and thus a woman's partner—either male or female—should also be treated.

See below for a more detailed discussion of pharmacological treatment methods.

Bacterial vaginosis infections

Bacterial vaginosis is a nonspecific vaginitis caused by the hundredfold overgrowth of anaerobic bacteria (e.g., *Gardnerella vaginalis*,

Mycoplasma hominis, *Mobiluncus*) as a result of a major disturbance in the vaginal flora. If this infection is suspected, routine vaginal cultures are not recommended because 50 to 60 per cent of all women normally carry *G. vaginalis* and are asymptomatic.¹⁰ It has been identified in 32 to 64 per cent of women attending STI clinics, 12 to 25 per cent of women attending regular medical clinics, and 10 to 26 per cent of women attending prenatal clinics.¹⁰

The main symptom of bacterial vaginosis is a thin, homogeneous, foul-smelling, greyish vaginal discharge with a pH>4.5. The vagina itself appears normal; however, a marked "fishy" odour is common.¹⁰

Sexual transmission may or may not be a risk factor. The causative organism can sometimes be seen in the partner, but treatment of the partner does not prevent recurrence. Risk factors for developing this infection include the presence of STIs, multiple sexual partners, and the use of an IUD.¹⁰

Diagnosis is done by microscopic examination of a vaginal swab for clue cells. (Clue cells are stippled or granulated epithelial cells whose cell borders are obscured by bacteria.)¹⁰ The presence of three of the four criteria—grey discharge, pH>4.5, "fishy" odour or clue cells—is diagnostic.

Treatment: Systemic therapy is effective

and metronidazole is the oral drug of choice. Its dosage is 500 mg twice daily for seven days or one single dose of 2 g. While the single dose has higher compliance rates, it results in higher relapse rates.¹⁰

Metronidazole 0.75 per cent vaginal gel daily for five days or clindamycin 2 per cent vaginal cream daily for seven days have fewer systemic effects and are almost as effective as oral metronidazole. Women who use clindamycin cream need to be aware that it can weaken latex products such as condoms, so another method of contraception may be needed.¹⁰

Bacterial vaginosis at one time was considered a relatively harmless infection. However, it is increasingly being associated with pelvic inflammatory disease, postabortion endometritis, postpartum endometritis, preterm labour and preterm birth. Prophylactic treatment prior to surgery for these conditions does improve outcomes, but treatment during pregnancy does not.⁴

See below for a more detailed discussion of treatment methods.

Pharmaceutical treatment Imidazole antifungals

The imidazoles, which all have a commonazole ring structure, are broad-spectrum antifungals and have a dose-related effect. They are the drugs of choice for yeast infections.⁵ In general, they are well tolerated with minimal adverse effects. Irritation at the application site is most often reported; however, this irritation can be difficult to differentiate from the symptoms of the vaginal infection. Systemic imidazoles have more adverse effects than topicals, including teratogenicity. Cure rates with the imidazoles range from 85 to 95 per cent.⁵

Imidazoles work by inhibiting the incorporation of acetate into the enzyme lanosterol demethylase and ergosterol, which is important to the integrity and function of fungal cell membranes. Both of these actions result in the absence of ergosterol in fungal cell walls. Disorganized, thick walls result, and the fungus is unable to absorb its essential nutrients.⁵

Mammalian cells are different than fungal cells and, as such, are not affected by imidazoles. Imidazoles have activity against gram-positive bacteria, anaerobes and trichomonas; this may be another mechanism of action, which accounts for the effectiveness of imidazoles in other vaginal infections.¹¹

Some of the imidazoles are available as nonprescription products. However, patients should be advised to visit their physician before buying these products if this is their first vaginal infection. They should also visit their physician if this is their third infection within the past six months, or if their symptoms have not resolved after the indicated number of days of using a specific nonprescription product. Women who are under 16 years of age, who are in their first trimester of pregnancy, or who have

TABLE 4 Patient counselling for use of topical antifungals*

- If symptoms do not improve after three days or persist after seven days, medical attention should be sought.
- Topical imidazoles should not be stopped during a menstrual period. Sanitary napkins are recommended, as tampons may absorb the active ingredient.
- Apply topical imidazoles at bedtime to prevent leakage due to gravity. A panty liner will protect undergarments. Some inserts are comprised of medication in a matrix, which remains once the medication is absorbed. The leftover matrix may be mistaken for vaginal discharge.
- Sex is not contraindicated during treatment. Because a male partner may act as a reservoir, condom use is sometimes recommended. However, some topical imidazole formulations have the potential to damage latex and if this is the method of birth control, a backup method is recommended. Use of a nonlatex condom can still be used to protect against disease transmission, but partners should also use other birth control measures.
- Follow the directions for the product. Even if you feel better, do not stop the course of therapy. Do not reuse disposable applicators.

* adapted from reference 9

TABLE 5 Tips to prevent vaginal infection recurrence*

- Do not wear tight-fitting or synthetic-fibre clothes, pantyhose or girdles. Cotton and cotton undergarments will allow the perineal area to “breathe.”
- Wipe from front to back after bowel movements or voiding, to prevent contamination with perineal organisms.
- Do not douche or use feminine sprays, perfumed soaps or vaginal deodorants.
- Do not use bubble bath. Instead, take showers and dry the genital area well.
- After swimming, change into dry clothes rather than sitting around in a wet bathing suit.
- Use nondeodorized feminine hygiene pads rather than tampons.
- If you have diabetes, keep your blood sugar well controlled, as high blood sugar can increase the risk of infection.
- Thoroughly clean spermicide applicators, diaphragms and sex toys. Having your partner use a condom may be a good idea.
- If you have been prescribed medication or use a nonprescription medication, follow the directions and take all of your medication, even if you feel better before the medication is finished.

* adapted from reference 9

compromised immunity or uncontrolled diabetes, should also see their physician for advice before using any nonprescription vaginal infection product. Manufacturers of nonprescription imidazole products recommend that pregnant women not use applicators to insert creams or vaginal tablets.

Table 3 provides the indication and dosing range for each of the antifungal products available, while Table 4 provides patient counselling tips on antifungal agents.

Clotrimazole

Clotrimazole has a systemic absorption of less than 0.5 per cent after application to intact skin.² Its fungicidal concentrations remain on the skin for as long as three days after application. The small amount that is absorbed is metabolized by the liver and excreted in the bile.²

When applied to the vagina, the most common side effect is local irritation in the form of mild burning, (approximately 1.6 per cent of the time).² If taken orally by accident, gastrointestinal irritation can be marked.

Cure rates for yeast infections are above 90 per cent. If re-infection occurs it is usually from rectal area contamination.⁶

Miconazole

Miconazole persists on intact skin for more than four days.² Its potential for absorption is about one per cent, but it can cause burning, itching and irritation about seven per cent of the time.² The base contained in ovule formulations may interact with latex, meaning concurrent use of condoms or diaphragms is not recommended.²

Terconazole

Systemic absorption of terconazole ranges from 5 to 16 per cent;² however, systemic side effects are usually mild (e.g., headache, fever, chills). Localized pain or burning have been reported.² However, these effects may be difficult to distinguish from vaginal yeast infection symptoms. Again, the base contained in ovule formulations is able to adversely affect latex in condoms and diaphragms and so concurrent use of these products is not recommended.²

Ketoconazole

Ketoconazole is an oral product and therefore patients may be more compliant with a product that is less “messy.”

Ketoconazole is generally well tolerated; however, pruritus, indigestion, nausea, vomiting and abdominal pain have been reported.² It inhibits liver enzymes, most notably CYP3A4, and has the potential for drug interactions (e.g., benzodiazepines, calcium channel blockers, carbamazepine, HMG-CoA reductase inhibitors, oral hypoglycemics, protease inhibitors).² Any drug that increases the gastric pH (e.g., antacids, H₂ blockers, proton pump inhibitors) reduces ketoconazole's absorption. Ketoconazole should not be taken with an acidic beverage (e.g., cola drink) since this will increase its absorption. It is contraindicated with hepatic failure, not recommended during pregnancy (reported to cause teratogenicity) and not the drug of first choice for vaginal yeast infections.²

Fluconazole

Fluconazole is used in a 150 mg dose of one capsule for vaginal yeast infections.² When compared to the topical imidazole formulations, fluconazole has the advantage of better compliance due to the one oral dose and lack of messy application. The use of fluconazole has been associated with hepatic toxicity, primarily in cases of underlying disease. It is contraindicated with hepatic disease or hepatic failure² and avoidance in pregnancy has been recommended.²

Adverse effects are minimal with rash, pruritus, dizziness, sleep disturbances, fatigue, general malaise and fever being reported. Fluconazole's effects on liver enzymes contribute to the potential for drug interactions with drugs metabolized in the liver (e.g., calcium channel blockers, benzodiazepines, carbamazepine, HMG-CoA reductase inhibitors, oral hypoglycemics, protease inhibitors).²

Nystatin

Nystatin is an antifungal available in tablet and liquid form for oral yeast infections. Nystatin vaginal inserts and cream are indicated for vaginal yeast infections. When compared to imidazoles, cure rates for vaginal yeast infections are lower (75 per cent versus 80 per cent).² Duration of treatment should be 14 days. Combination products of nystatin and metronidazole are indicated for mixed vaginal infections.²

Metronidazole

Metronidazole has both antibacterial and antiprotozoal activity. It is thought that the drug interferes with bacterial and protozoal replication.⁶

When taken orally, gastrointestinal adverse effects (e.g., diarrhea, nausea, vomiting, indigestion, unpleasant taste) are the most preva-

lent side effects reported.¹⁰ The most notable drug interaction is with alcohol. A disulfiram-like reaction occurs as the result of metronidazole's inhibition of acetaldehyde metabolism: the acetaldehyde accumulates, causing severe nausea and vomiting. Avoiding alcohol during therapy, and at least one day following therapy, is recommended.⁶

Metronidazole is also available as a vaginal gel which minimizes systemic effects. Adverse effects of the gel include local irritation, which may be difficult to distinguish from symptoms of bacterial vaginosis. Metronidazole is combined with nystatin in products for the treatment of vaginal infections that may have mixed causative organisms.⁶

Natural products

Natural remedies are often promoted for the treatment of vaginal infections. Some examples include garlic, calendula, goldenseal, marshmallow root, yarrow and tea tree oil.² As well, oral vitamin C has been suggested as a prophylactic to build up the immune system while oral biotin has been suggested to inhibit yeast growth.² The effectiveness of these therapies has not been proven. Moreover, they have the ability to disrupt the natural vaginal flora, produce irritation and/or allergies, and therefore should not be recommended.⁷

Traditional therapies for yeast infections have included benzoic acid, crystal violet, potassium iodide, selenium sulfide, sodium thiosulfate, boric acid inserts and topical gentian violet 1 per cent solution. These therapies have been replaced by the imidazoles, which are both safer and often more effective.⁷

Yogurt is often cited as a natural remedy for vaginal yeast infections because it contains *Lactobacillus*. Evidence of effectiveness is anecdotal in nature; however, yogurt itself is not harmful and some practitioners recommend women who are susceptible to yeast infections consume yogurt while taking broad-spectrum antibiotics. The yogurt must contain active *Lactobacillus* cultures (i.e., not pasteurized).⁷

An alternative to the active cultures in yogurt is, in theory, *acidophilus*. It is also purported to contain active cultures, which restore normal bacterial flora. Unfortunately, refrigeration is required to keep cultures active in most products, and many products are sold without active cultures.⁷

Nonpharmaceutical approaches

Perineal hygiene

All women, including prepubertal girls, should be instructed about perineal hygiene. With good hygiene, vaginal infections are less likely to occur (see Table 5).

Douching

The perception is that douching cleanses the vaginal area, removing "dirt" and "germs."

This perception may be perpetuated by the media, advertising, and female relatives and friends. In fact, however, the vagina is essentially self-cleaning, meaning douching is unnecessary.

Douching should not be recommended: women who douche at least once a month have higher rates of bacterial vaginosis, pelvic inflammatory disease, preterm delivery and cervical cancer.⁸ Douching is thought to either remove one or more essential bacteria or disrupt the normal vaginal microbiology, leading to increased vulnerability to vaginal infections and related conditions.

Douches often contain ingredients such as perfumes, preservatives and antimicrobial substances that are, at the very least, able to cause vulvar and vaginal irritation. Allergies to these ingredients are also possible. Vinegar is often used as an ingredient in douches in an attempt to maintain a healthy acidic pH in the vagina. However, its safety and efficacy are unknown and if an actual vaginal infection is present, vinegar will be ineffective in combating it.⁶

The pharmacist's role

Many women are reluctant to ask about vaginal infections. The topic is personal and they may not be aware of the availability of effective products. Community pharmacists can position themselves as both knowledgeable and reliable. A private area where a woman feels comfortable in discussing her symptoms, merchandising of nonprescription products in a private and quiet area, and avoiding the use of slang and offensive descriptive words when counselling are ideal measures.

Patient information should be accurate and easily understood by the general public. All other information should be discarded. Organizing a file folder of patient education material to be kept in the dispensary or patient counselling area means that counselling resources are readily accessible when women ask about vaginal infections. All patient information needs to be reviewed regularly to ensure that it is current and accurate, and the community pharmacy telephone number should be included on the information. Women should be encouraged to telephone if they have any further questions.

For pharmacists who do not already have this information, adding references to the dispensary is advisable. The journal *American Family Physician* has useful patient information (<http://www.aafp.org/afp/20041201/contents.html>), as does the Mayo Clinic (www.mayoclinic.com). The various local health authorities and manufacturers of products for vaginal infections may also be useful sources of information.

Community pharmacists should be aware of resources within their community, such as

women's health clinics, both for potential referral and as information sources. Community pharmacists have no obligation to report suspected STIs; however, they should be aware of the STI reporting system in their community and of local STI clinics.

Summary

Vaginal yeast infections, trichomonas and bacterial vaginosis are common vaginal infections about which women consult community pharmacists. Many topical imidazoles are available without a prescription for self-selection and use by women. Community pharmacists must be cognizant of risk factors for vaginal infections, non-prescription and prescription therapy use, and when it is appropriate to refer a woman to her physician.

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For further reading

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Questions

CASE 1

You notice CK surreptitiously looking through the “feminine hygiene” area in your pharmacy. She looks uncomfortable, but finally approaches you and asks if you can recommend something for “a....a....personal itch.” CK is married but has no children. You know both her and her husband.

1 You begin by asking CK about her possible vaginal infection symptoms. Which of the following symptoms would be key to your recommendations?

- what type, if any, of vaginal discharge and odour were present
- what her temperature was
- the presence of nausea and vomiting
- the location of flank tenderness
- evidence of muscle pain

2 If present, which of the following factors would make CK more susceptible to vaginal yeast infections?

- diabetes mellitus, low-dose estrogen birth control tablets, pregnancy or compromised immune system
- diabetes mellitus, low-dose estrogen birth control tablets, hypertension or compromised immune system
- diabetes mellitus, high-dose estrogen birth control tablets, pregnancy or compromised immune system
- low-dose estrogen birth control tablets, pregnancy, hypertension or compromised immune system
- high-dose estrogen birth control tablets, pregnancy, hypertension or compromised immune system

3 CK asks you about douching. What can you tell her?

- The scented products will give CK a feeling of “freshness.”
- Douching is an effective way of removing “germs” from the vagina.
- The vagina is self-cleansing; douching is really unnecessary and not recommended.
- Mixing her own solution for douching at home is more economical; then she can add her own perfume for a personal scent.
- Regular douching will reduce CK’s risk for diseases such as pelvic inflammatory disease.

4 Faced with the various nonprescription vaginal yeast infection products, CK asks you to help her choose a product. What can you tell her?

- Clotrimazole products may be less irritating than miconazole products.
- If CK’s symptoms have been present for one day or less, then a one-day product should be chosen; between one and three days, a three-day product; and between three and seven days, a seven-day product.
- Vaginal cream products should not be used by women after menopause.
- Vaginal inserts are more effective than vaginal creams because they have a more concentrated effect.
- CK should not use a nonprescription vaginal

yeast infection product until after she has tried yogurt.

5 Under what circumstances would you not recommend a nonprescription yeast infection product for CK?

- CK has experienced a similar infection two years ago, and her physician diagnosed it as a yeast infection.
- CK is over 16 years of age.
- CK is in her first trimester of pregnancy.
- CK is sexually active—about once a week with her husband.
- CK uses tampons.

6 What information can you give CK on using nonprescription yeast infection products?

- These products are best used first thing in the morning.
- If CK is menstruating, she should stop using these products.
- CK cannot have sex if she is using a nonprescription yeast infection product.
- If CK is menstruating, she should continue to use these products, but switch to a sanitary napkin because tampons may “soak up” the medication.
- Douching with yogurt and applying yogurt topically is recommended along with these products.

7 To make uncomfortable clients like CK more comfortable, what measures can you take in your pharmacy?

- Display the nonprescription yeast infection products in an open area where they are easily seen.
- Provide printed information with your pharmacy name and telephone number along with the product so that clients can telephone with questions.
- Avoid inviting these clients into your private consulting area, as this would draw attention to them.
- Make sure you ask them about their sexual history.

CASE 2

MC comes into the pharmacy wearing a spandex and nylon body suit, and asks you for another tube of cream for her “girl” problem. She seems to purchase a tube of an imidazole cream every month, and when quizzed she tells you that after a couple of days she feels fine. She also tells you she’s heard about pills for these “things” and wants to know if they would work better than the cream. MC is in her mid-30s, of average weight, and takes no other medication.

8 What are some possible reasons for MC’s recurrent infections?

- good personal hygiene, undiagnosed diabetes or wearing spandex and nylon
- the presence of an infection such as trichomonas, improper hygiene or undiagnosed diabetes
- undiagnosed diabetes, wearing cotton undergarments or pre-existing psoriasis

- good personal hygiene, pregnancy or wearing spandex and nylon
- the presence of another infection such as trichomonas, wearing cotton undergarments or pregnancy

9 Vaginal yeast infections, trichomonas and bacterial vaginosis are the most common vaginal infections seen by community pharmacists. What would you tell MC about the difference among the symptoms?

- Bacterial vaginosis is characterized by a severe itch, strong fishy odour and a dry cottage cheese discharge.
- Bacterial vaginosis is characterized by little irritation, minimal (if any) odour and a grey homogenous discharge.
- Trichomonas is characterized by a severe itch, strong fishy odour and a dry cottage cheese discharge.
- Trichomonas is characterized by a severe itch, minimal (if any) odour and a grey homogeneous discharge.
- Vaginal yeast infections are characterized by a severe itch, minimal (if any) odour and a dry cottage cheese discharge.

10 MC has asked you about oral antifungals for her vaginal infection. Which statement is true about the available oral antifungals?

- Nystatin is an imidazole and is effective in a one-day dose.
- Oral antifungals are more effective than topically applied antifungals and therefore should always be recommended.
- Ketoconazole is the drug of choice for vaginal yeast infections.
- Fluconazole is effective in a 150 mg once-daily dose for vaginal yeast infections.
- Topical imidazole products should not be used with any oral antifungal products.

11 Is using another tube of a nonprescription yeast product appropriate for MC?

- No. With recurrent vaginal infection symptoms, a medical evaluation should be recommended because the symptoms may be due to trichomonas or other organisms.
- No. Yogurt with natural cultures may be a suitable alternative.
- Yes. These products have worked previously.
- Yes. These products are effective against all vaginal infections.
- Yes. Using these products along with yogurt will eliminate the infection.

CASE 3

EF has a vaginal “irritation” and is concerned because, as she confides in you, she has a new man in her life. EF tells you that her underwear has been “soiled” recently, but otherwise she feels fine. She is in her mid-30s, of average weight and taking no medications.

12 Because EF is sexually active, her symptoms may be the result of a sexually transmitted infection. What can you tell her about the sexual transmission of vaginal infections?

Questions

- a) Only yeast infections are sexually transmitted.
- b) Only bacterial vaginosis infections are sexually transmitted.
- c) Yeast infections, bacterial vaginosis and trichomonas are never sexually transmitted; they are the result of poor hygiene.
- d) Trichomonas is considered to be a sexually transmitted infection; however, in some instances, the causative organisms for yeast infections and bacterial vaginosis can be isolated from male partners.
- e) If EF has only one sexual partner, she does not have to be concerned whether vaginal infections are sexually transmitted or not.

13 Some vaginal infections may be asymptomatic and others may have marked symptoms. Of the following vaginal infections, which is most likely to have symptoms?

- a) yeast infections
- b) trichomonas
- c) bacterial vaginosis
- d) all, because all three always have symptoms
- e) none, because all three vaginal infections never have any symptoms

14 What practical advice can you give EF to prevent sexual transmission of vaginal infections?

- a) Men don't have vaginas, and thus are not at risk for transmission of vaginal infections.
- b) Oral sex is fine, as there is no risk for transmission of any vaginal infection.
- c) Only EF has to be treated, not her partner, because she is the one with the infection.
- d) EF cannot use any cream or insert because they can all damage condoms.
- e) Treatment of EF's partner always needs to be considered, and in the case of sexually transmitted infections, both EF and her partner need to be treated.

CASE 4

AB gives you a prescription written by her physician. She tells you that she has a vaginal irritation, which was diagnosed after a physical examination. You know both AB and her husband. She is in her mid-40s and takes only ranitidine 150 mg daily.

15 Her prescription is for clotrimazole vaginal cream and AB asks you how her physician diagnosed her condition. What can you tell her?

- a) During AB's physical examination her physician may have taken a vaginal swab and examined it under a microscope for budding yeast cells. These cells characterize yeast infections, for which clotrimazole vaginal cream is indicated.
- b) All vaginal infections are caused by yeast infections and AB's physician has written the prescription for clotrimazole because it is indicated for vaginal yeast infections.
- c) During AB's physical examination, her physician will have taken a vaginal swab and sent it away to a lab for analysis. AB should wait for these lab results before using the clotrimazole vaginal cream.
- d) Blood tests are needed to identify the cause

of vaginal irritations, especially if AB has any medical condition or takes any medication.

- e) With vaginal irritations, sloughing of cells occurs and a simple urine test will accurately identify the source of these cells and thus the cause of the irritation.

16 If her prescription had been for metronidazole, what can you tell AB about the metronidazole prescription?

- a) The prescription is for oral metronidazole 2 g once for two people. Because AB is only one person, you offer to telephone her physician to correct this error.
- b) The prescription is for metronidazole vaginal gel, 500 mg to be applied twice daily for five days. Because oral metronidazole is the only effective treatment in vaginal infections, regardless of the type of infection, you offer to telephone her physician to change it to oral metronidazole.
- c) The prescription is for metronidazole tablets, 2 g once. Because alcohol increases the drug's bioavailability, you recommend that she take it with a small quantity of an alcoholic beverage.
- d) The prescription is for metronidazole tablets, 2 g once. Because alcohol can cause a disulfiram-like reaction, you recommend that she avoid alcohol while taking the drug and for at least one day afterwards.
- e) The prescription is for metronidazole tablets 500 mg twice daily for seven days. Because her infection is very contagious, you recommend that she wash her hands thoroughly each time after taking the medication.

17 Six months later, AB comes in with a prescription for amoxicillin 500 mg three times a day for 10 days, and miconazole vaginal cream to be applied daily for three days. She tells you she has a systemic bacterial infection and mentions in passing that she is experiencing vaginal irritation. AB is concerned that an error has been made by the doctor because she has been prescribed two drugs. What can you tell her?

- a) An error has been made because her physician probably meant to write metronidazole for triple therapy of an *H. pylori* infection (i.e., amoxicillin and metronidazole along with AB's ranitidine).
- b) An error has been made because miconazole is an antifungal and not effective against AB's bacterial infection. Only the amoxicillin prescription should have been written.
- c) An error has not been made since broad-spectrum antibiotics like amoxicillin may cause an overgrowth of yeast and because AB may have a vaginal yeast infection, which amoxicillin may exacerbate.
- d) An error has not been made but AB's physician should have prescribed ketoconazole 400 mg twice daily for five days rather than miconazole vaginal cream, especially since AB takes ranitidine.
- e) An error has not been made but AB needs to wait 14 days after completing the course of amoxicillin before using the miconazole cream.

CASE 5

GH is a 25-year-old client who asks where the black panty liners are. She needs the black ones because she is going to be attending a formal dinner and she doesn't want to stain her black dress. She also wants the ones with the deodorant, because she doesn't want to risk "smelling." GH is taking no medications. During your discussion, you confirm that she has had a vaginal infection before but currently has no symptoms of an infection. She tells you she "never wants to go through one again."

18 What can you recommend to GH about preventing vaginal infections?

- a) GH should always wipe the perineal area back to front to avoid cross-contamination.
- b) GH should wear breathable underclothing and have good personal hygiene.
- c) GH should always use a feminine hygiene spray to smell fresh.
- d) GH should regularly wear a girdle as this will provide a physical barrier to the organism that causes vaginal infections.
- e) GH should choose deodorant panty liners and tampons because the deodorant will chemically protect her from vaginal infections.

19 GH asks you about a Japanese therapy that she found on the Internet. Apparently, taking one capsule will mean that she will never get a vaginal infection. How would you respond?

- a) The Internet is an excellent source of information and this remedy sounds excellent as well.
- b) The Internet is an excellent source of information; however, the therapy is for acute vaginal infections and GH will have to take more than one capsule.
- c) No product can prevent vaginal infections: if she develops an infection and wants to treat it naturally she should try garlic juice or topical tea tree oil.
- d) While the Internet may be a source of some accurate information, the Japanese therapy is less expensive if it is bought at your pharmacy.
- e) While the Internet may be a source of some accurate information, good personal hygiene is a better and more economical approach to preventing vaginal infections.

20 What can a community pharmacist do to make assisting clients such as GH easier?

- a) Keep in mind that prevention and treatment of vaginal infections is a medical problem, so a community pharmacist should always refer clients such as GH to their physician.
- b) If you are male, make sure you always have female staff available to help you ask questions.
- c) Because many vaginal infections are linked to sexual behaviour, always take a full sexual history.
- d) Approaches to treatment of vaginal infection have not changed; thus, there is no need to keep printed material.
- e) Maintain an easily accessible file folder for relevant and current information as well as patient handouts about vaginal infections, and provide privacy for counselling.

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