Microbial Diseases of the Urinary and Reproductive Systems

Identify the portals of entry for microbes into the reproductive system.
- Urinary system regulates chemical composition of blood and excretes nitrogenous waste
- Microbial diseases of these two systems from outside infection or opportunistic infection by normal microbes
- Microbes usually enter the urinary system through the urethra
- Flushing action of urine and acidity of urine have some antimicrobial value (used to use urine for earaches!)
- Microbes usually enter the reproductive system through the:
  - Vagina (females) or urethra (males)

Female Urinary Organs

Female Reproductive Organs

Male Reproductive & Urinary Organs

Normal Microbiota

Describe the normal microbiota of the upper urinary tract, the male urethra, and the female urethra and vagina.
- Urinary bladder and upper urinary tract sterile when normal as well as male urethra
- Lactobacilli predominant in the vagina during reproductive years
- >1,000 bacteria/ml or 100 coliforms/ml of urine indicates infection

List the antimicrobial features of the urinary system.
Urethritis, cystitis, and ureteritis are inflammations of lower urinary tract. Opportunistic gram(-) from intestines often cause urinary infections. Nosocomial infections follow catheterization. >1000 bacteria sp. per ml urine or >100 coliforms per ml urine = infection. Cystitis usually caused by E. coli & S. saprophyticus. May also be caused by Proteus, Klebsiella, Enterococcus, Pseudomonas. E. coli usually causes pyelonephritis, inflammation of kidneys. Antibiotic-sensitivity tests may be required before treatment.

Leptospirosis
- Leptospira interrogans spirochete
- Reservoir: Dogs and rats
- Transmitted by skin/mucosal contact from urine-contaminated water
- Chills, fever, headache, muscle aches
- Diagnosis: Isolating bacteria or serological tests

Bacterial Diseases of Reproductive System
- Most of these are STD's (sexually transmitted diseases)
- Prevented by condoms
- Treated with antibiotics

Describe modes of transmission for urinary and reproductive system infections.

Gonorrhea
- Neisseria gonorrhoeae
- Attaches to oral or urogenital mucosa by fimbriae
- Females may be asymptomatic; males have painful urination and pus discharge
- Treatment with antibiotics
- Untreated may result in
  - Endocarditis
  - Meningitis
  - Arthritis
  - Ophthalmia neonatorum – infant eye infections

List the causative agents, symptoms, methods of diagnosis, and treatments for gonorrhea, NGU, PID, syphilis, LGV, chancroid, and bacterial vaginosis.

Gonorrhea – most common reported STD in U.S.
Gonorrhea – antibiotic resistance

- Any inflammation of urethra not caused by *N. gonorrhoeae*
- *Chlamydia trachomatis* (most common STD)
  - May be transmitted to newborn’s eyes
  - Painful urination and watery discharge
  - Symptoms mild or lacking, but can cause sterility and uterine tube inflammation
- Other causes of NGU:
  - *Mycoplasma hominis*
  - *Ureaplasma urealyticum*

Nongonococcal Urethritis (NGU)

- Extensive bacterial infection of female pelvic organs
  - *N. gonorrhoeae*
  - *Chlamydia trachomatis*
  - Salpingitis – infection of uterine tubes (next slide)
  - Can block uterine tubes and cause sterility
  - Chronic abdominal pain

Pelvic Inflammatory Disease (PID)

- Extensive bacterial infection of female pelvic organs
  - *N. gonorrhoeae*
  - *Chlamydia trachomatis*
  - Salpingitis – infection of uterine tubes (next slide)
- Can block uterine tubes and cause sterility
- Chronic abdominal pain

Syphilis

- *Treponema pallidum* – spirochete not yet cultured in vitro, must be grown in cell cultures
- Transmitted by direct contact, invades intact mucosa or through skin breaks

Syphilis

- Primary stage: small, hard-based chancre at site of infection; bacteria then invade blood and lymph system
- Secondary: Skin and mucosal rashes are widely disseminated
- Latent period: No symptoms with healing of lesions
- Tertiary: at least 10 years later gummas (tertiary lesions) on many organs
- Congenital: *T. pallidum* crosses placenta causing neurological damage
- Primary & secondary stages treated with penicillin
• **Syphilis (Treponema pallidum)**

  - **Direct diagnosis:**
    - Darkfield microscopic identification of bacteria from primary and secondary lesions
    - Staining with fluorescent-labeled, monoclonal antibodies
  - **Indirect, serological diagnosis:**
    - VDRL, RPR, ELISA test for reagin-type antibodies using cardiolipid (Ag)
    - FTA-ABS tests for anti-treponemal antibodies

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• **Characteristic lesions of syphilis**

  ![Characteristic lesions of syphilis](image)

  - [a] Chancres of primary stage on a testicle in genital area.
  - [b] Lesions of secondary syphilis rash on a patient's surface area: one of the body may be affected with such lesions.
  - [c] Ulcers of tertiary stage on the back of an area; granules such as these are rarely seen today at the site of infection.

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• **Lymphogranuloma Venereum (LGV)**

  - *Chlamydia trachomatis*
  - Primarily a disease of tropical and subtropical regions
  - Initial lesion on genitals heals without scarring
  - Bacteria spread through lymph causing enlargement of lymph nodes, obstruction of lymph vessels, swelling of external genitals
  - Treatment: doxycycline

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• **Chancroid (Soft Chancre)**

  - *Haemophilus ducreyi*
  - Ulcer on genitalia or mouth
  - May break through surface
  - Infection of lymph nodes
  - Treatment: erythromycin and ceftriaxone
Gardnerella vaginalis
- Infection without inflammation
- Diagnosis by clue cells, higher vaginal pH
- Treatment: metronidazole

Herpes simplex virus 2 (HSV-2)
- Symptoms are painful urination, genital irritation, fluid-filled vesicles
- Neonatal herpes transmitted to fetus or newborns, resulting in neurological damage or fatalities
- Recurrences from viruses latent in nerves after trauma or hormonal changes
- Suppression: acyclovir or valacyclovir

Human papillomaviruses
- Treatment: Imiquimod to stimulate interferon
- HPV 16 causes cervical cancer and cancer of the penis
- DNA test to detect cancer-causing strains
- Vaccination against HPV strains

Candida albicans
- Grows on mucosa of mouth, intestinal tract, genitourinary tract
- NGU in males
- Vulvovaginal candidiasis has lesions that itch and irritate
- Predisposing factors: pregnancy, diabetes, tumors, broad-spectrum antibiotics
- Diagnosis by microscopic identification and culture of yeast from lesions
- Treatment: clotrimazole or miconazole

Trichomonas vaginalis
- Found in semen or urine of males carriers
- Vaginal infection (pH increase) causes irritation and profuse discharge
- Diagnosis by microscopic identification of protozoan
- Treatment: metronidazole
<table>
<thead>
<tr>
<th>Condition</th>
<th>Pathogen</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Respiratory Infections</td>
<td><em>Haemophilus influenzae</em></td>
<td>Nasal discharge, cough, fever, sore throat</td>
</tr>
<tr>
<td>Otitis Media</td>
<td><em>Pneumococcus</em></td>
<td>Earache, fever, redness</td>
</tr>
<tr>
<td>Sinusitis</td>
<td><em>Streptococcus pneumoniae</em></td>
<td>Headache, fever, nasal congestion</td>
</tr>
<tr>
<td>Bronchitis</td>
<td><em>Moraxella catarrhalis</em></td>
<td>Cough, fever, shortness of breath</td>
</tr>
<tr>
<td>Pneumonia</td>
<td><em>Staphylococcus aureus</em></td>
<td>Fever, cough, shortness of breath</td>
</tr>
<tr>
<td>Gastrointestinal Infections</td>
<td><em>Escherichia coli</em></td>
<td>Diarrhea, vomiting, abdominal pain</td>
</tr>
<tr>
<td>Urinary Tract Infections</td>
<td><em>E. coli</em>, <em>Staphylococcus saprophyticus</em></td>
<td>Frequency, urgency, pain</td>
</tr>
<tr>
<td>Sexually Transmitted Infections</td>
<td><em>Chlamydia trachomatis</em>, <em>Neisseria gonorrhoeae</em></td>
<td>Genital discharge, pain, fever, elevated body temperature</td>
</tr>
<tr>
<td>Venereal Diseases</td>
<td><em>Herpes simplex virus</em></td>
<td>Ulcers, fever, pain</td>
</tr>
<tr>
<td>Pregnancy Complications</td>
<td><em>Toxoplasma gondii</em></td>
<td>Yellow discharge, pain</td>
</tr>
<tr>
<td>Obstetric Complications</td>
<td><em>Group B streptococcus</em></td>
<td>Fever, labor pain, malformations in newborn</td>
</tr>
</tbody>
</table>

*Note: The table provides a general overview of common infections and their symptoms. Detailed medical advice should be sought from a healthcare provider.*