

Acute and Chronic Cervicitis

Pathology, microbial ecology, and clinicopathologic interpretation

A clinicopathologic teaching lecture

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Learning objectives

- Identify the epithelial compartments of the cervix and transformation zone.
- Explain how estrogen-dependent glycogen and lactobacilli shape the vaginal environment.
- Differentiate clinically important cervicitis from incidental inflammation and vaginitis.
- Connect infection, reparative atypia, testing, and upper genital tract complications.

Why cervical inflammation matters

Frequently minor

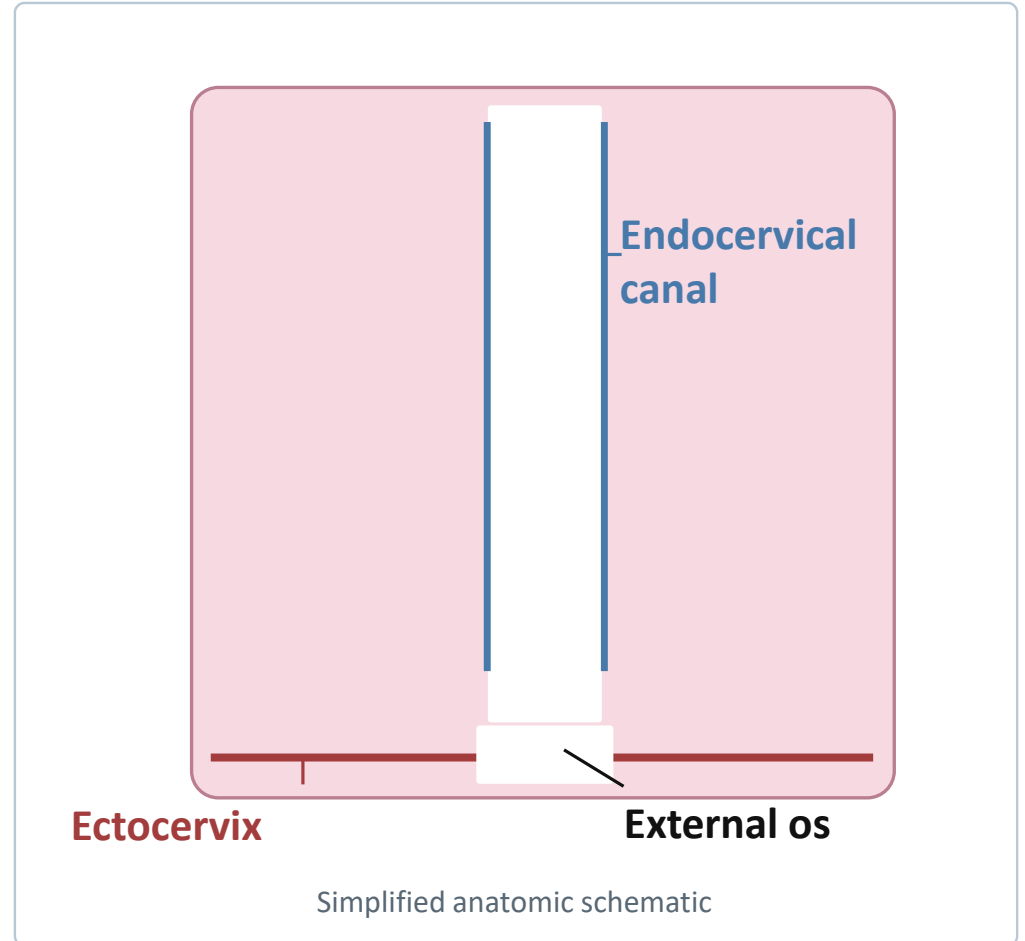
- Background cervical inflammation is common.
- Morphologic inflammation alone does not identify an organism.
- Clinical context determines significance.

Potentially consequential

- Some sexually transmissible infections involve the endocervix.
- Ascending infection can affect the upper genital tract.
- Marked inflammation may complicate Pap interpretation.

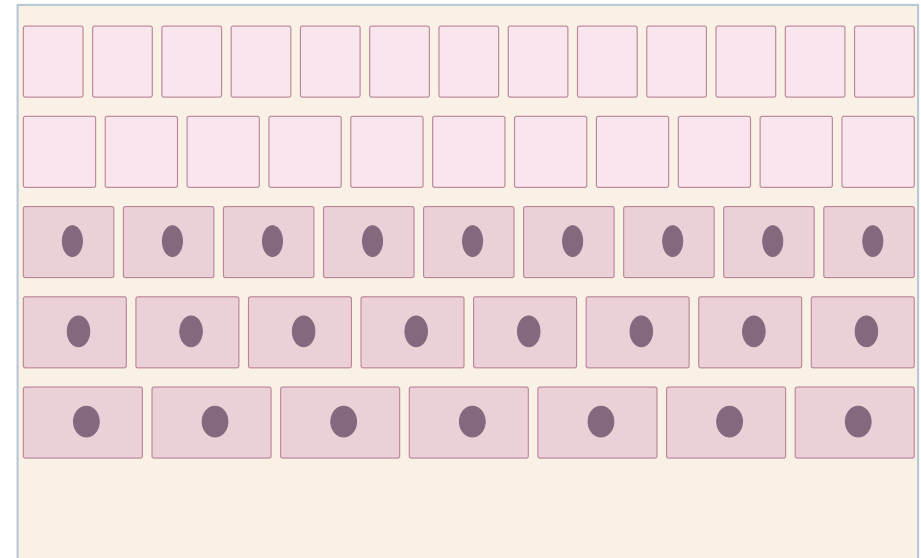
Cervix: Two epithelial compartments

- Ectocervix: Mature stratified squamous mucosa, continuous with the vagina.
- Endocervical canal: Mucus-secreting columnar epithelium.
- The external os connects the ectocervix to the cervical canal.



Ectocervical squamous mucosa

- Several epithelial cell layers produce a protective squamous surface.
- Maturation and glycogen accumulation are hormonally regulated.
- A mature surface differs from the immature epithelium of the transformation zone.

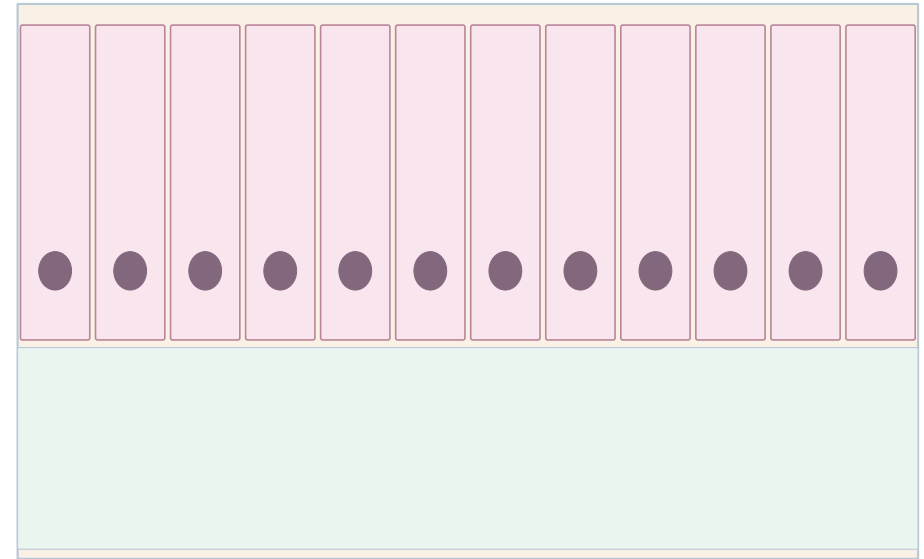


Layered squamous cells

Schematic

Endocervical columnar epithelium

- The endocervix is lined by mucus-secreting columnar cells.
- The canal is anatomically continuous with the uterine cavity.
- Columnar and squamous epithelia meet at the squamocolumnar junction.

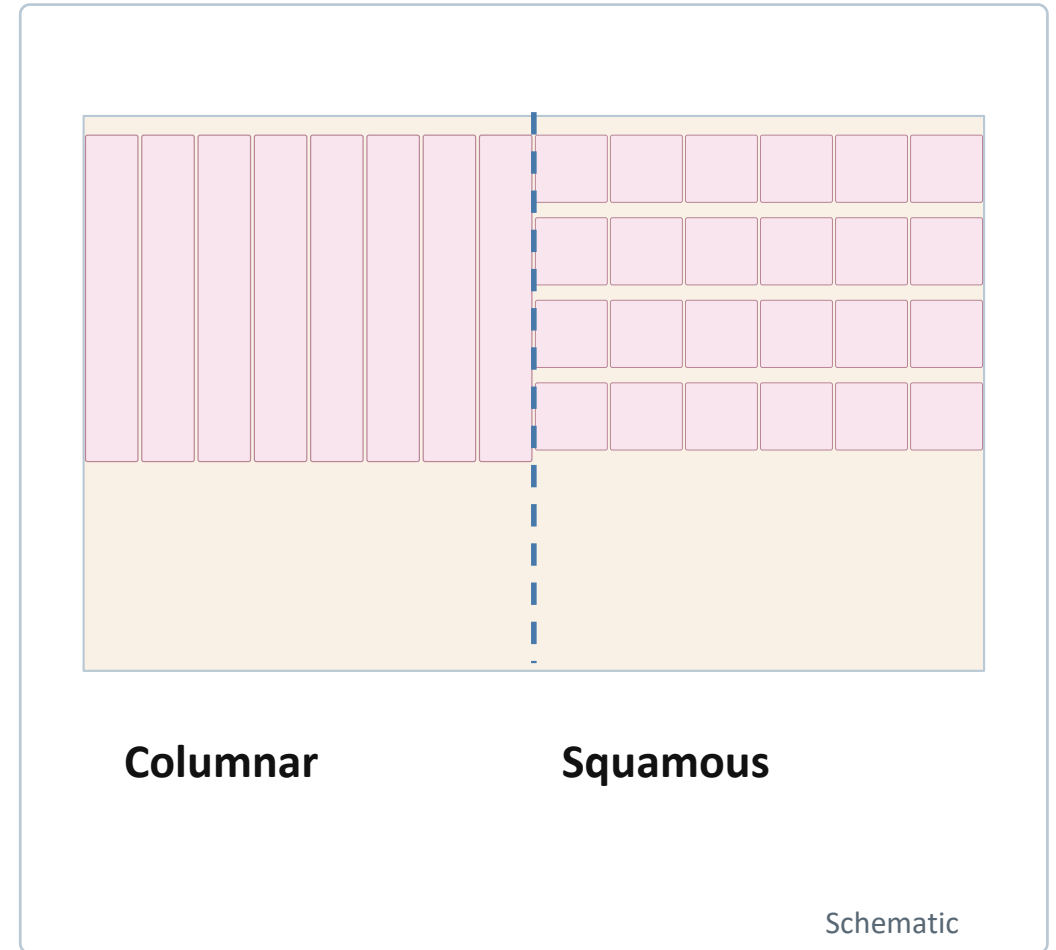


Single columnar lining

Schematic

Squamocolumnar junction

- The junction is an anatomic boundary between two epithelial phenotypes.
- Its position varies with age and hormonal milieu.
- Location matters when interpreting cervical mucosal injury and metaplasia.



Transformation zone and metaplasia

Squamous metaplasia

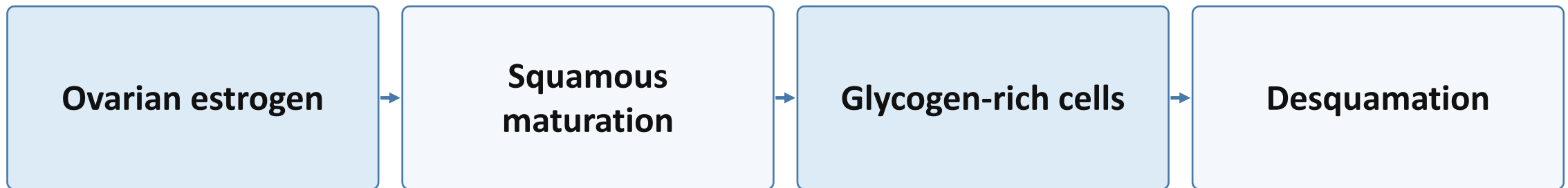
- Replacement of glandular epithelium by squamous epithelium.
- A common maturation/remodeling process.
- Does not itself establish infection or dysplasia.

Transformation zone

- Area where columnar and squamous epithelia coexist.
- Contains immature/metaplastic epithelium.
- Site relevant to HPV-associated precursor lesions.

Menarche reshapes the cervical milieu

- Ovarian estrogen increases at menarche.
- Squamous epithelium matures and accumulates intracellular glycogen.
- Desquamation makes glycogen available to vaginal microorganisms.



Glycogen is a substrate—not a pathogen

- Maturing squamous cells accumulate glycogen vacuoles.
- Shed cells contribute substrate to the vaginal ecological system.
- Microbial metabolism helps establish the vaginal chemical environment.

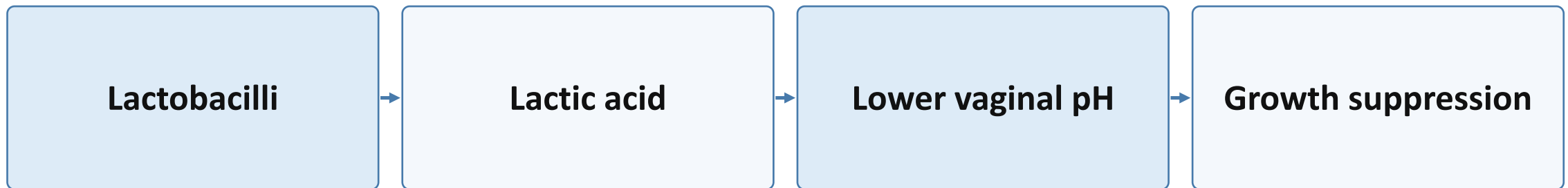


Lactobacilli dominate the usual flora

- Lactobacilli as major organisms in the normal vaginal community.
- The microbial ecosystem includes other endogenous aerobic and anaerobic species.
- The usual community contributes to resistance against overgrowth by other organisms.

Lactic acid and vaginal pH

- Lactobacilli generate lactic acid.
- A normally acidic vaginal environment with pH below 4.5.
- Acidity suppresses growth of many other organisms.

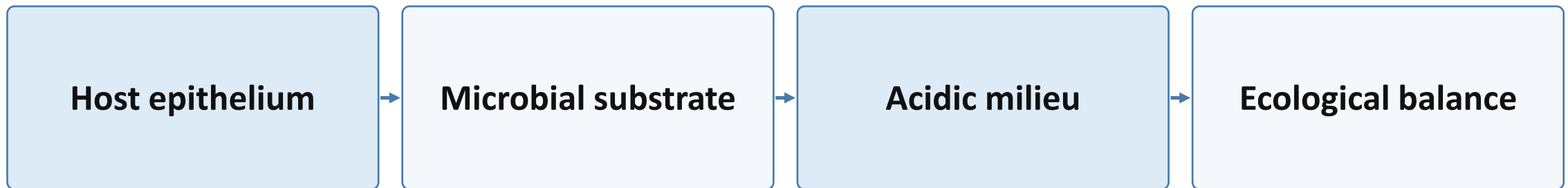


Hydrogen peroxide: Textbook mechanism

- Robbins also describes bacteriotoxic hydrogen peroxide (H_2O_2) production by lactobacilli under acidic conditions.
- Its production falls when the environment becomes more alkaline.
- This ecological mechanism is not, by itself, a diagnostic criterion for cervicitis.

The mucosal ecosystem is layered

- Squamous maturation supplies glycogen-containing cells.
- Microbial metabolism promotes an acidic environment.
- Perturbations can permit proliferation of other organisms.



Not all cervical inflammation is disease

Common background findings

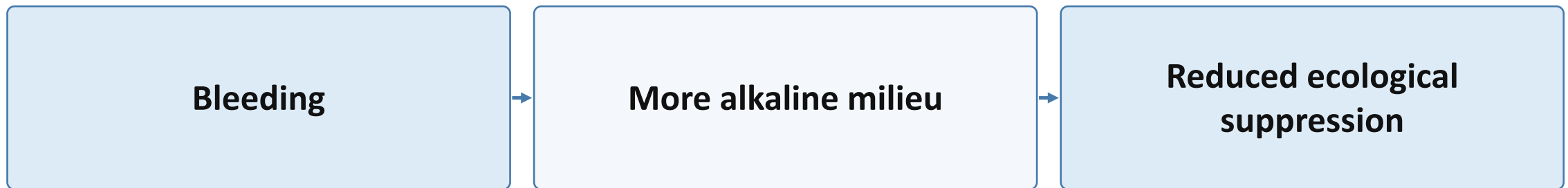
- Low-grade inflammation may be present without major clinical consequence.
- An inflammatory infiltrate does not establish an STI.
- Do not overinterpret a single microscopic finding.

Clinically significant cervicitis

- An important pathogen may be involved.
- The infection may be transmissible.
- Upper tract or pregnancy-related effects require consideration.

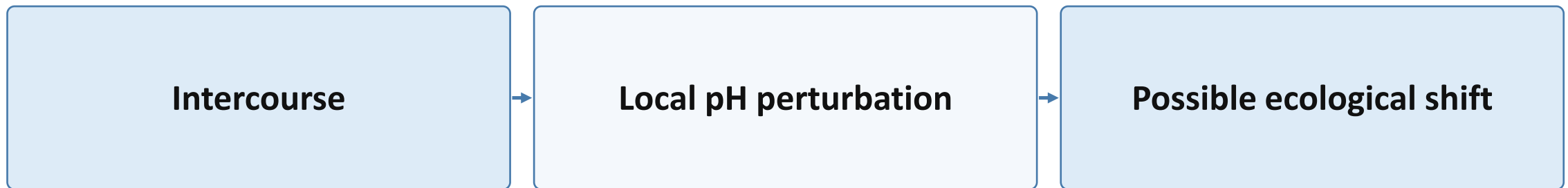
Bleeding can perturb vaginal acidity

- Blood temporarily alters the local acid–base environment.
- A higher pH can reduce lactobacillus-associated H_2O_2 production model.
- The shift may favor overgrowth by other organisms.



Intercourse and transient pH shifts

- Sexual intercourse among events that can raise local pH.
- Changes in vaginal chemistry should not automatically be equated with STI.
- Clinical assessment must distinguish exposure, symptoms, and causative infection.



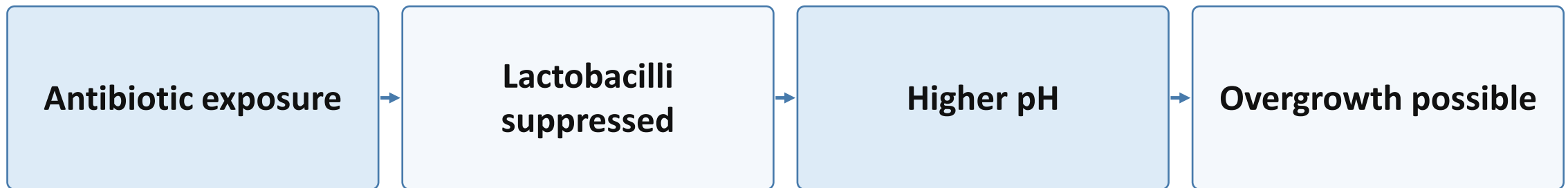
Vaginal douching disrupts the milieu

- Douching is cited as a cause of altered vaginal acidity.
- A perturbed ecosystem can permit proliferation of other organisms.
- This provides a mechanistic explanation for some non-specific inflammatory conditions.



Antibiotics can alter microbial balance

- Antimicrobial treatment may suppress protective lactobacilli.
- Vaginal pH may rise when lactobacilli are reduced.
- Disrupted flora can permit other organisms to expand.



Dysbiosis is a mechanism, not a diagnosis

Ecological alteration

- Changes in bacterial composition or vaginal chemistry.
- May contribute to vaginitis or nonspecific cervical inflammation.
- Requires assessment of symptoms and findings.

Proven cervical STI

- Defined pathogen and clinical context.
- Organism-specific testing often needed.
- Has transmission and upper tract implications.

Anatomic level defines the syndrome

Lower genital tract

- Vaginitis: Primarily vaginal mucosa and discharge.
- Cervicitis: Inflammatory process at the cervix.
- The two processes may coexist.

Upper genital tract

- Endometritis and salpingitis suggest ascending involvement.
- PID has systemic/pelvic manifestations.
- A different level of urgency and assessment is required.

Acute versus chronic is a host-response pattern

Acute-pattern inflammation

- Prominent neutrophilic response.
- May accompany mucopurulent exudate.
- Not specific for one pathogen.

Chronic-pattern inflammation

- Lymphocytes and plasma cells predominate.
- Can coexist with tissue repair.
- Duration cannot be inferred precisely from one section.

Potentially important infectious causes

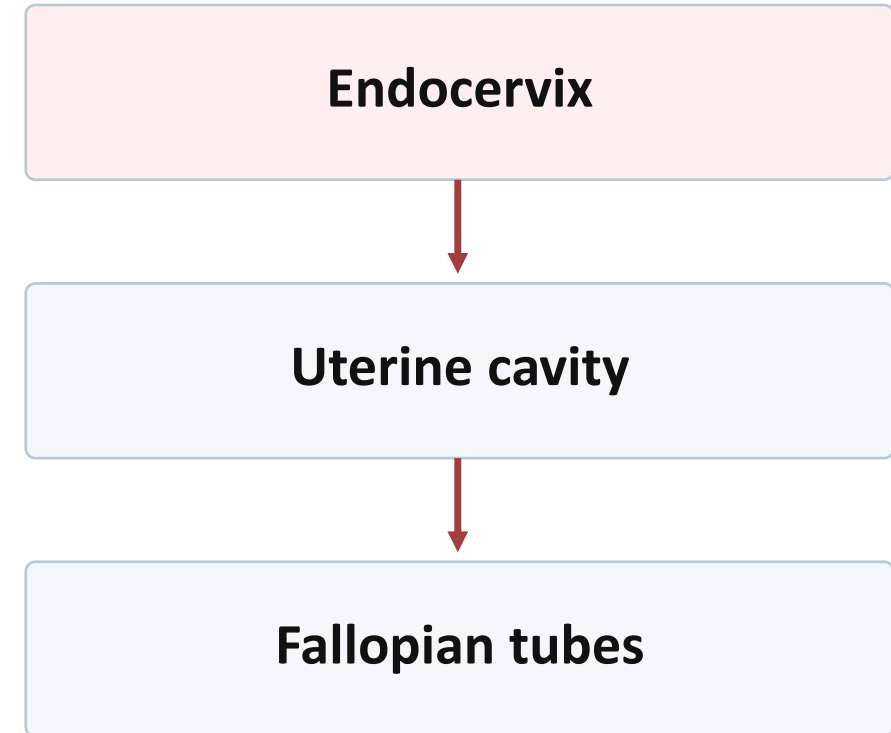
Organism group	Pathology relevance	Clinical implication
Chlamydiae	Endocervical infection	Can ascend to endometrium/tubes
Gonococci	Acute mucosal inflammation	Potential PID
Mycoplasmas	Association with cervicitis	Species distinction matters
Herpes simplex virus	Possible cervical infection	Recognize viral disease context

Chlamydia: Endocervical infection

- Chlamydia trachomatis as an important cause of cervicitis.
- Cervical infection can be clinically subtle.
- Anatomical continuity permits spread beyond the cervix in some patients.

Chlamydial infection can ascend

- Ascending disease can involve endometrium and fallopian tubes.
- Endometritis and salpingitis are components of upper genital tract infection.
- This is why a local cervical infection may have reproductive consequences.



Potential ascending route — schematic

Gonorrhea may begin in the endocervix

- The endocervical mucosa as a common initial site of gonococcal infection.
- Gonococci can subsequently spread toward the fallopian tubes and adnexa.
- The initial infection is not necessarily confined to the cervix.

Gonococcal inflammation is often suppurative

Inflammatory morphology

- Marked acute inflammation of infected mucosal surfaces.
- Neutrophil-rich exudate can occur.
- Gram-negative diplococci may be seen in neutrophils.

Diagnostic caution

- Microscopy does not replace definitive organism testing.
- Culture or detection of gonococcal DNA/RNA is used.
- The clinical syndrome is broader than cytomorphology.

Mycoplasma terminology requires precision

Robbins discussion

- Lists mycoplasmas among causes of cervical inflammation.
- Earlier Ch. 22 notes M. Hominis and Ureaplasma in genital infections.
- This is a broad microbiologic grouping.

Clinical interpretation

- M. Genitalium is evaluated selectively, especially with persistent symptoms.
- Do not treat all genital mycoplasmas as equivalent.
- Species-level context changes the significance.

HSV is an important viral consideration

- Herpes simplex virus is named among infections associated with clinically significant cervicitis.
- A viral cause differs etiologically from bacterial overgrowth.
- The clinical context and targeted testing determine its relevance.

Trichomoniasis can involve the cervix

- Trichomonas vaginalis is a sexually transmitted protozoan.
- An erythematous vaginal/cervical mucosa and a “strawberry cervix” appearance.
- Vulvovaginal discharge and discomfort may dominate the clinical picture.

Bacterial vaginosis is not synonymous with cervicitis

Bacterial vaginosis

- Altered vaginal bacterial ecology.
- Thin, malodorous discharge is.
- The abnormality primarily concerns the vaginal environment.

Cervicitis

- Endocervical inflammation and possible mucopurulent exudate.
- May arise with a transmissible pathogen.
- Coinfection or overlap is possible.

Candida is a useful competing diagnosis

Typical vulvovaginal candidiasis

- Often pruritus, erythema, and curdlike discharge.
- May follow antibiotic-associated flora disruption.
- Primarily a vulvovaginal syndrome.

Clinical distinction

- Symptoms alone do not localize pathology to the cervix.
- Separate vaginal findings from endocervical signs.
- Targeted testing is preferable to etiologic guessing.

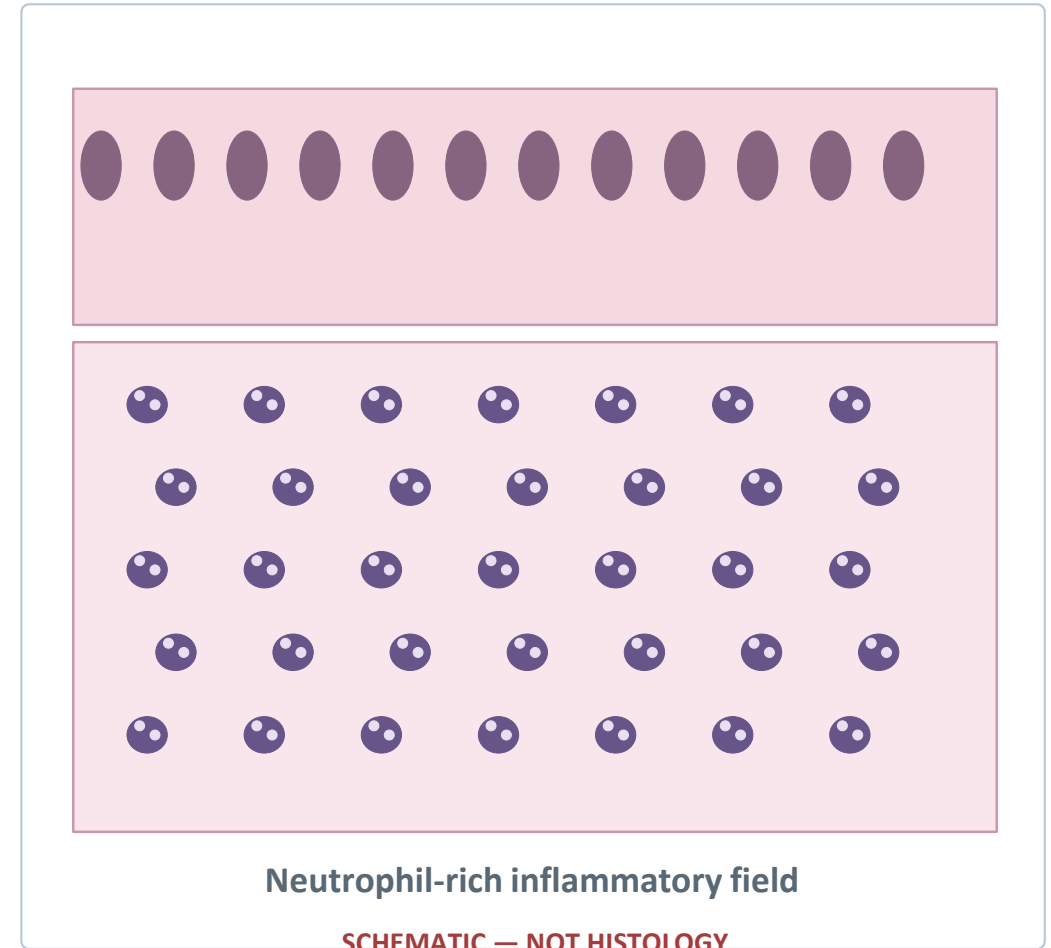
Three pathways to cervical inflammation

- Ecological disturbance may contribute to inflammatory change.
- A defined infectious agent can directly affect the cervical mucosa.
- Host response and epithelial repair shape subsequent cytologic appearances.



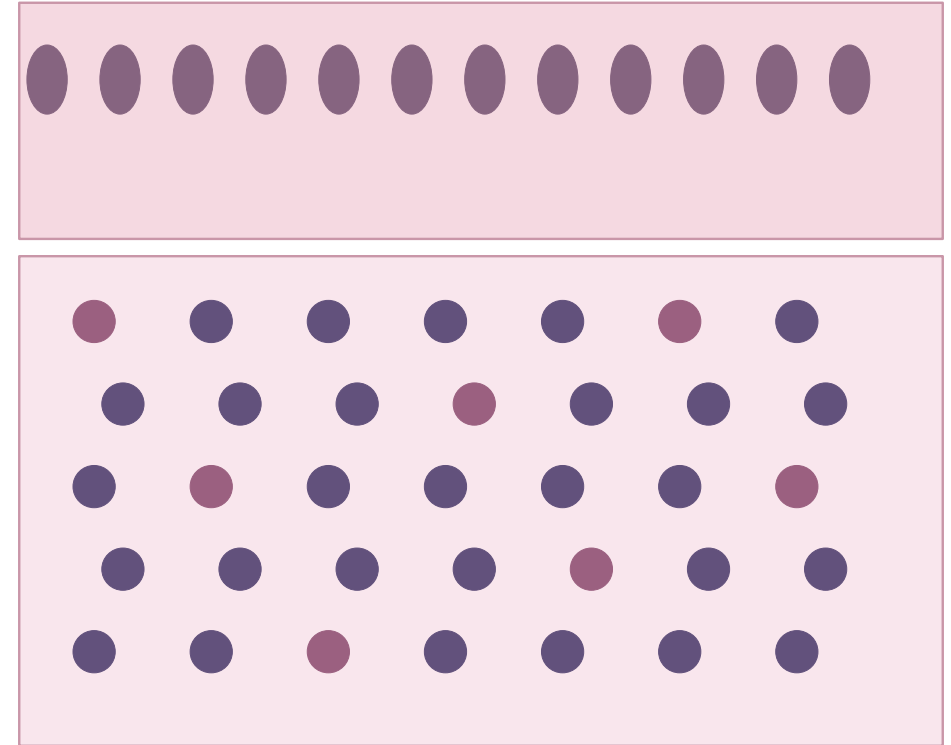
Acute inflammation: A schematic

- Neutrophils are the principal illustrated inflammatory cells.
- Epithelial exudation and superficial injury may accompany an active response.
- Schematic illustration: Not a diagnostic photomicrograph.



Chronic inflammation: A schematic

- Lymphocytes and plasma cells illustrate the chronic inflammatory pattern.
- The stromal infiltrate can persist with epithelial repair.
- Schematic illustration: Not a diagnostic photomicrograph.



Lymphoplasmacytic inflammatory field

SCHEMATIC — NOT HISTOLOGY

Inflammatory pattern does not name the agent

What morphology may show

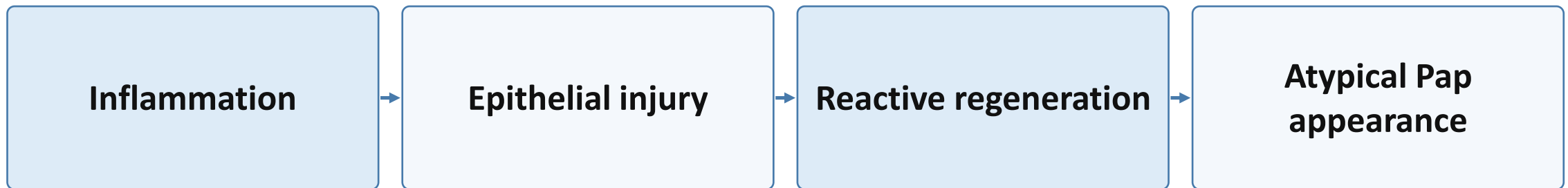
- Intensity and cellular composition of inflammation.
- Epithelial injury or reparative changes.
- Changes warranting evaluation in context.

What morphology alone cannot prove

- A specific transmissible organism.
- Exact duration of infection.
- Whether upper genital tract infection is present.

Epithelial repair follows marked inflammation

- Pronounced cervical inflammation can injure the epithelial surface.
- Regeneration and reparative nuclear changes follow injury.
- These changes can cause atypical-appearing exfoliated squamous cells.



Reactive atypia can alter a Pap result

- Robbins explicitly links marked cervicitis to reparative/reactive epithelial changes.
- Atypical-appearing cells may be shed into cytologic samples.
- Cytologic abnormality therefore requires interpretation rather than automatic etiologic attribution.

Inflammation and neoplasia are not equivalent

Reactive epithelial atypia

- May arise in the setting of marked inflammation.
- Recognized in the tissue-injury and repair context.
- Does not alone establish an HPV precursor lesion.

Cervical intraepithelial lesion

- Belongs to the separate HPV-associated neoplastic pathway.
- Requires its own cytologic/histologic assessment.
- Do not dismiss significant atypia without appropriate evaluation.

Pap findings do not identify a cervical pathogen

- Pap cytology screens for cellular abnormalities; It is not the preferred pathogen-specific test for common bacterial STIs.
- Reactive inflammation may affect cellular appearance and reporting.
- Use an organism-directed test when a transmissible cause is suspected.

Two major clinical signs of cervicitis

Mucopurulent exudate

- Purulent or mucopurulent material in the endocervical canal.
- Can be visible or observed on swabbing.
- One accepted sign of cervical inflammation.

Endocervical friability

- Sustained bleeding easily induced by gentle swabbing.
- Supports the clinical cervicitis syndrome.
- May occur with or without exudate.

Mucopurulent endocervical exudate

- Focus on the endocervical canal, not only vaginal secretions.
- Mucopurulent material is a clinical sign, not proof of gonorrhea or chlamydia.
- Laboratory testing establishes likely etiology when indicated.

Endocervical observation



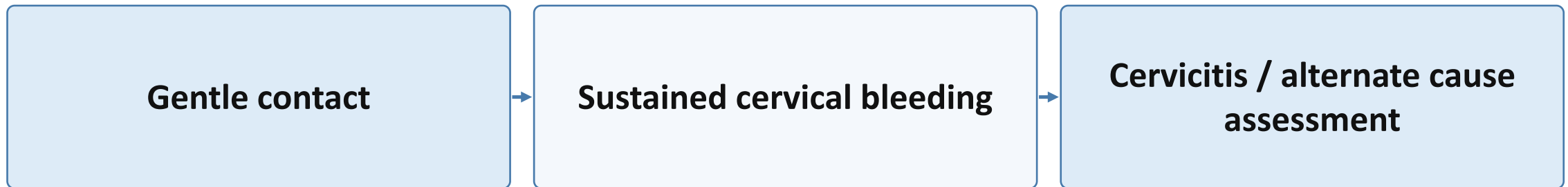
Cervicitis suspected



Etiologic testing

Cervical friability and induced bleeding

- Gentle contact may produce readily induced endocervical bleeding.
- Friability indicates local mucosal vulnerability, not a particular pathogen.
- Bleeding warrants consideration of other cervical causes as well.



Cervicitis may have few symptoms

- CDC guidance notes that cervicitis is frequently asymptomatic.
- When symptoms occur, vaginal discharge or intermenstrual/postcoital bleeding may be reported.
- Absence of symptoms does not exclude a clinically relevant cervical infection.

Discharge does not localize the process

Vaginal source

- Pruritus, vaginal irritation, characteristic discharge.
- Consider yeast, trichomoniasis, and bacterial vaginosis.
- Vaginal investigations may be needed.

Cervical source

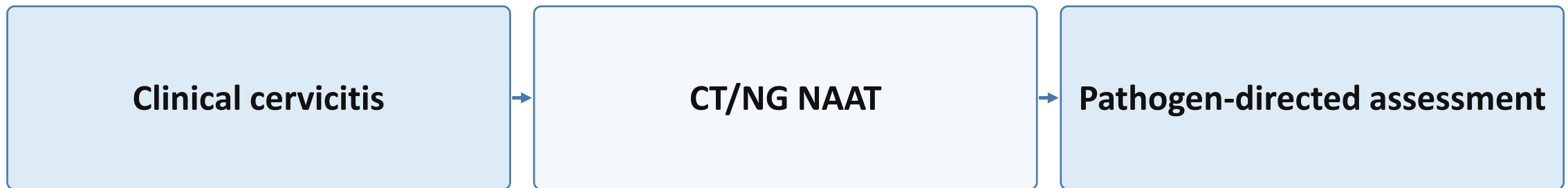
- Endocervical exudate or easy bleeding on examination.
- Consider gonorrhea/chlamydia and other causes.
- Evaluate upper tract red flags.

Clinical history shapes pretest probability

- Review symptoms, timing, sexual exposure, and previous infections.
- Assess pregnancy status and possible pelvic/upper tract symptoms.
- Risk determines whether empiric management is considered while testing is pending.

NAAT is central for chlamydia and gonorrhea

- When cervicitis is suspected, assess for *C. Trachomatis* and *N. Gonorrhoeae*.
- Use appropriate nucleic acid amplification testing (NAAT) specimens.
- Do not infer pathogen identity from a nonspecific inflammatory infiltrate.

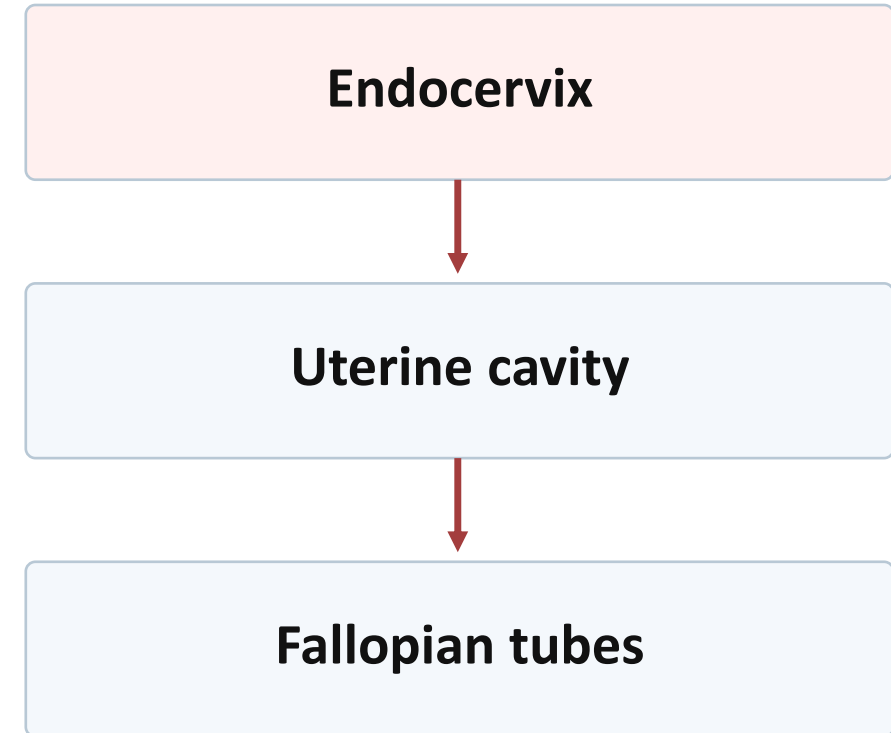


Assess overlapping vaginal infections

- CDC recommends evaluation for bacterial vaginosis and trichomoniasis in cervicitis.
- Wet-mount microscopy has limited sensitivity for trichomoniasis.
- If symptomatic and wet mount is negative, additional testing may be needed.

Cervicitis can signal upper tract disease

- The cervix is continuous with the uterus and fallopian tubes.
- Ascending infection may cause endometritis or salpingitis.
- Pelvic pain, tenderness, or fever requires assessment beyond the cervix.



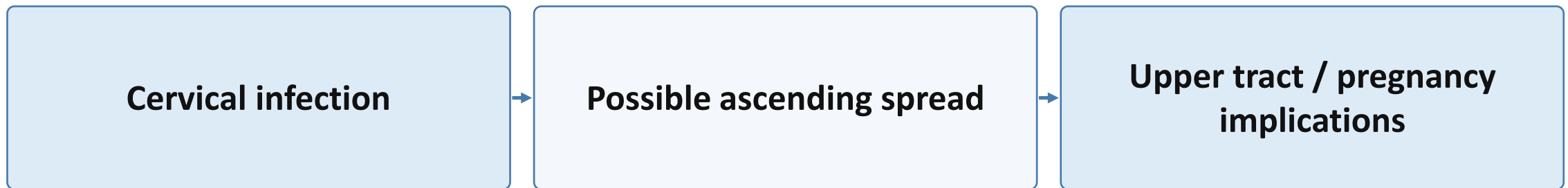
Potential ascending route — schematic

Pelvic inflammatory disease: Clinical context

- PID as ascending infection of the upper female genital tract.
- The syndrome may involve pelvic pain, adnexal tenderness, fever, and discharge.
- Its significance exceeds that of isolated mild cervical inflammation.

Reproductive and pregnancy relevance

- Important cervical pathogens can spread beyond their initial site.
- Associations with upper tract disease and pregnancy complications.
- This is one reason to identify transmissible cervical infections rather than labeling all inflammation nonspecific.



Persistent cervicitis: Consider M. Genitalium

- CDC considers M. Genitalium testing in persistent or recurrent cervicitis in selected patients.
- Evaluate re-exposure and adherence before assuming resistance or an unusual organism.
- A persistent syndrome should prompt a structured reassessment.

Not every genital mycoplasma merits testing

Potentially actionable

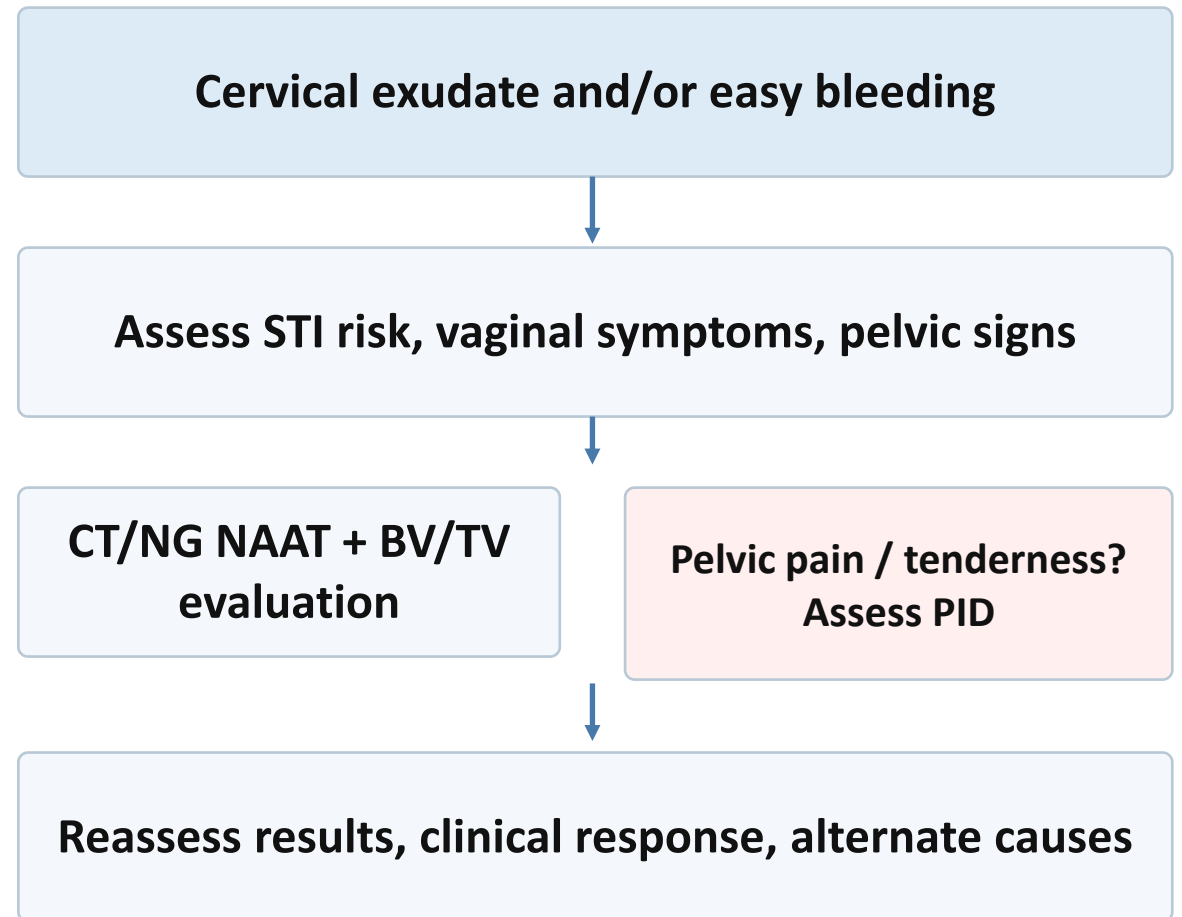
- M. Genitalium may be considered in persistent/recurrent disease.
- Clinical context and validated tests are essential.
- An organism is not automatically causal because it is detectable.

Routine testing discouraged

- CDC does not recommend routine testing for Ureaplasma species or M. Hominis in cervicitis.
- This limits indiscriminate microbial panels.
- Distinguish carriage from disease.

A structured cervicitis evaluation

- Localize inflammation at the cervix by examination.
- Test for common treatable infections and evaluate overlapping vaginitis.
- Screen for clinical features suggesting PID; Revisit other diagnoses if persistent.



A polyp can explain cervical bleeding

Endocervical polyp

- Benign exophytic lesion from the cervical canal.
- May produce irregular spotting or bleeding.
- Fibrous stroma with endocervical glandular covering.

Cervicitis

- Inflammatory disorder, often without a mass.
- May cause contact bleeding and exudate.
- Infection assessment guided by examination and risk.

Persistent symptoms require a wider differential

- Consider reinfection, untreated co-infection, or treatment failure.
- Reassess bacterial vaginosis and other local conditions.
- Gynecologic assessment may be appropriate for cervical polyps, dysplasia, or other noninfectious causes.

Etiology, findings, and next investigation

Question	Clue	Approach
Cervicitis?	Exudate / friability	Localize clinically
Chlamydia or gonorrhea?	Exposure / clinical suspicion	CT/NG NAAT
Vaginal co-diagnosis?	Discharge / irritation	BV / Trichomonas evaluation
Upper tract involvement?	Pelvic pain / tenderness / fever	Assess PID urgently

Case 1: Friable cervix without symptoms

An asymptomatic patient has sustained endocervical bleeding after gentle swabbing. No specific organism has been identified.

- What clinical finding has been demonstrated?
- Does the finding establish the etiology?
- Which common STIs merit testing?

Interpretation: Endocervical friability supports cervicitis. It is not organism-specific; Assess for chlamydia and gonorrhea with NAAT in context.

Case 2: Elevated vaginal pH

A patient has altered vaginal pH after recent antibiotic therapy and new discharge, but no documented endocervical inflammation.

- What ecological mechanism is plausible?
- Can cervical infection be diagnosed from pH alone?
- What competing vaginal disorders should be considered?

Interpretation: Disruption of lactobacilli may increase pH and permit overgrowth. Vaginal pH alone does not diagnose cervicitis; Assess for vaginitis/BV and cervical findings.

Case 3: Atypical squamous cells with inflammation

A cervical cytology sample is reported as inflammatory, with reactive-appearing atypical squamous cells.

- How can marked inflammation affect epithelium?
- Does inflammation prove an STI?
- Can a significant lesion be dismissed on this basis?

Interpretation: Inflammation can cause reparative/reactive changes. Cytologic atypia neither identifies infection nor eliminates the need for appropriate neoplasia assessment.

Case 4: Cervicitis plus pelvic tenderness

A patient with cervical discharge also reports pelvic pain and has adnexal tenderness.

- Does isolated cervicitis explain the entire presentation?
- Which anatomic pathway is concerning?
- What broader syndrome must be assessed?

Interpretation: Ascending infection must be considered; Assess for pelvic inflammatory disease with possible endometritis/salpingitis.

The diagnostic contrasts that matter

Entity	Predominant site	Discriminating focus
Cervicitis	Cervix	Endocervical exudate / friability
Vaginitis	Vagina	Vaginal symptoms and organism assessment
PID	Upper genital tract	Pain, tenderness, systemic findings
Endocervical polyp	Endocervical canal	Exophytic lesion / spotting
Cervical SIL	Cervical epithelium	Separate neoplastic cytology/histology pathway

Integrated pathology summary

- An estrogen-dependent, glycogen-rich squamous mucosa supports vaginal lactobacilli and acidity.
- Microbial imbalance and defined pathogens may produce cervical inflammation; Significance varies widely.
- Marked inflammation can trigger epithelial repair and atypical Pap appearances.
- Clinical signs, pathogen-specific tests, and upper tract assessment determine management relevance.

References and source distinctions

Robbins, Cotran & Kumar. Pathologic Basis of Disease. 11th ed. (2026). Chapter 22, The Female Genital Tract; cervical anatomy and cervicitis, pp. 904–905; infections/PID, pp. 897–899.

Centers for Disease Control and Prevention. Sexually Transmitted Infections Treatment Guidelines (2021): Urethritis and Cervicitis. <https://www.cdc.gov/std/treatment-guidelines/urethritis-and-cervicitis.htm>

Diagrams are original native PowerPoint schematics; histologic cell drawings are illustrative, not specimen images.