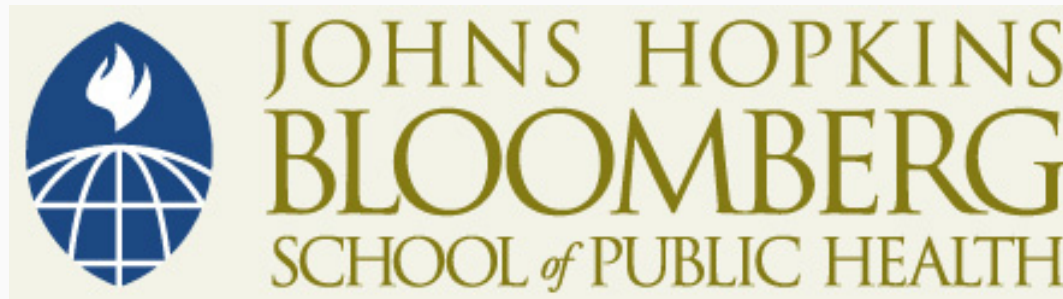


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# Vaginitis and Pelvic Inflammatory Disease (PID)

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## Section A

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### Introduction to Vaginitis

# Vaginitis

- Most common reason for patient visit to OB/GYN resulting in 10 million patient visits per year
- Three primary infections in order of prevalence:
  - Bacterial vaginosis
  - Candidiasis
  - Trichomoniasis

# Trichomonas

- Parasitic
- Relatively common
- Cosmopolitan
- Sexual intercourse
- 25% have been infected sometime
- No congenital infections
- Not generally spread by fomites

# Pathogenesis (Trichomonas)

- Desquamation of vaginal epithelium
  - Leukocytic inflammation
  - May persist for years
- Symptomatology
  - **Women**—itching, burning, frothy discharge worsens after menses chronic
  - Symptoms persist, however, parasite remains
  - **Men**—mild urethritis (rare to carry in men due to urine discharge)
- Strawberry hemorrhage in 5% of infected women
  - No discharge—pathogenesis is not well understood

# Diagnosis

- Diagnosis—wet mount sensitivity ~ 50%
- InPOuch culture method—requires incubation and lab facilities
- PCR—research based method, not clinically approved
- Diagnosis in men—sensitivity of culture is poor

# Trichomonas in Men

- Necessary to treat male partners
- Trich accounts for up to 10-15% of non-gonococcal urethritis
- Reservoir in males—unclear
  - Prostate?



# Treatment

- Metronidazole, 2 gm single dose
- For resistant infection—only after confirmation—tinidazole

# Trichomonas Vaginitis

- Extremely common
- Prevalent vs. incident infection
- May facilitate HIV transmission
- Associated with adverse pregnancy outcome
- Metronidazole resistance in ~1%



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## Section B

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### Vulvovaginal Candidiasis

# Vulvovaginal Candidiasis

- 13 million cases annually
- 85-90% *C. albicans*—in immunointact hosts
- Commensal—pathogen

# Vaginal Candidiasis

- Inflammatory vaginitis
- Prevalence/incidence high (30-50% of college students)
- *C. albicans* part of normal flora

# Treatment

- Oral fluconazole (150 mg either as single or multiple dose)
- Vaginal imidazoles—clotrimazole, miconazole, terconazole
- **Remove underlying causes if possible**
- No treatment of partners indicated

# Current Issues

- The biggest problem is that patients ascribe other infections to “yeast infection”
- Non-candida species
- Fluconazole resistance (emerging issue, especially in immunocompromised hosts)



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## Section C

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### Bacterial Vaginosis



# Bacterial Vaginosis

- Ecologic disturbance of vaginal flora
- Not an STD
- Dx based on clinical criteria or gram stain

# Role of Vaginal Lactobacillus

- Acidophilic lactobacilli—predominant organisms in normal vaginal flora
- Produce lactic acid and peroxide
  - Results in acidic pH (3.6-4.2)
  - Inhibits growth of *G. vaginalis* and anaerobes
- Lactobacilli found in 96% of women with normal vaginal flora vs. only 35% of women with BV

# Vaginal pH

- Normal vaginal pH(3.8-4.2) controls composition of normal vaginal flora
- Normal vaginal pH creates an unfavorable environment for BV pathogens
- Elevated vaginal pH is associated with the following:
  - Loss of H<sub>2</sub>O<sub>2</sub> producing lactobacilli
  - Bacterial vaginosis, trichomoniasis
  - May enhance HIV transmission

# Primary Pathogens in BV

## Anaerobes

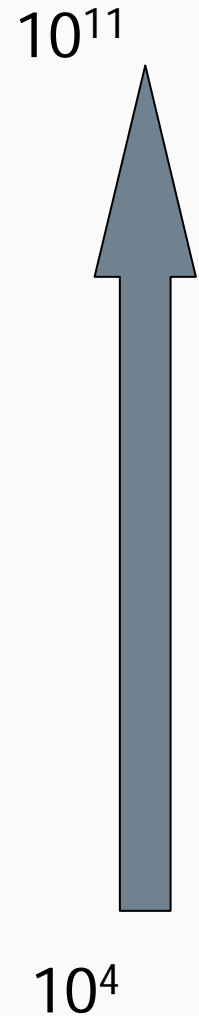
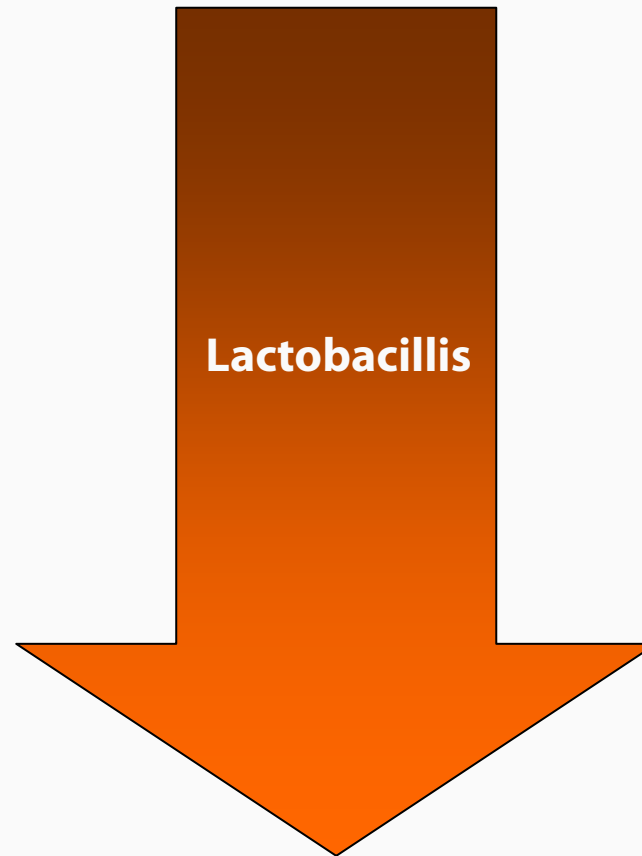
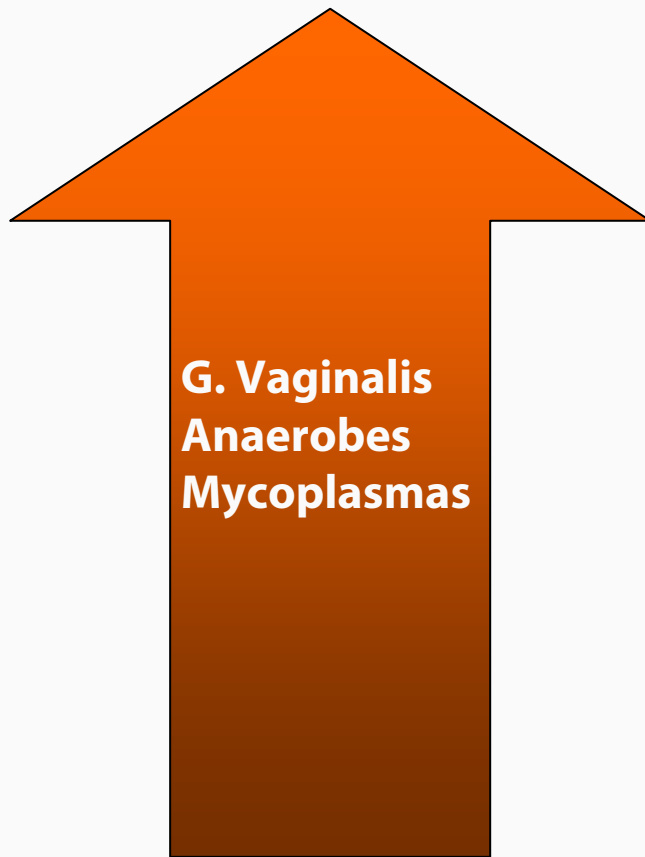
- Bacteroides sp (prevotella)
- Peptostreptococcus sp
- Eubacterium sp
- Mobiluncus sp

## Facultative Anaerobes

- Gardnerella vaginalis
- Mycoplasma hominis

# Microbial Shifts Occurring in BV

- BV is characterized by 100-1,000 fold increase in pathogenic bacteria
- Lactobacilli concentrations decrease substantially



# BV Pathogenesis Issues

- Traditional microbial model does not fit clinical observations
- Early studies in 1960s suggest transmissibility
- Multiple studies demonstrate transmissibility in lesbians
- Recurrence common
- Ecologic vs. infectious?

# New Technology

- Diagnostic technology based on 16S ribosome RNA detection
- Transformed bacteriology
- Links clinical bacteriology to genetics
- Infections due to fastidious and non cultivable organisms

# Findings in BV

- Seminal work done by Marrazzo (University of Washington); Martin (LSU)
- BV highly diverse
- Finding of *Atopium* and *Clostridial species*
- Finding of new BV-associated organisms



# Conclusions

- There may be an infectious agent in BV
- Implications for prevention, treatment, and control
- Probably a combination of pathogen and ecology

# Factors Affecting Normal Vaginal Flora

- Douching
- Antibiotic therapy
- Hormonal changes
- Use of oral contraceptives
- Foreign bodies (tampons, diaphragms, IUD)
- Semen
- Menses

# Clinical Diagnosis of BV (Amsel Criteria—Three of Four Required)

Clinical Criteria	Sensitivity	Specificity
<i>Wet Mount</i>	High	High
<i>Whiff Test</i>	Moderate	Moderate
<i>pH Test</i>	High	Low
<i>Homog Discharge</i>	Low	Low

# Gram Stain Criteria for BV (Spiegel Method)

- Few lactobacilli
- Large quantity of Gardnerella morphotypes
- Abundant small Gram (-) bacilli and Gram (+) cocci
- Curved gram variable bacilli (may be scored from 0-10, based on #1, 2, 4)

# Syndromes

## Sporadic

- Primary
- Secondary (antibiotic, pregnancy)

## Recurrent

- Primary
- Secondary (DM, hormones, immunosuppression)

# Gynecologic Complications of BV

- Pelvic Inflammatory Disease (PID)
- Post-abortal PID
- Post-surgical infection
- Cervical intraepithelial neoplasia
- Mucopurulent cervicitis

# Obstetric Complications of BV

- Pre-term birth
- PROM
- Amniotic fluid infection
- Chorioamnionitis
- Postpartum endometritis

# BV and Endometritis

- Presence of BV or anaerobies from endometrial biopsies was associated with increased risk for acute plasma cell endometritis



# VIPS: Vaginal Infections and Prematurity Study

- 10,397 pregnant women followed prospectively
- Multi-center
- Pre-term delivery associated with the following:
  - Minority status
  - Previous LBW infant
  - Abortions/stillbirth
  - Smoking
  - UTI in pregnancy
  - Antibiotic use prior to enrollment

# VIPS Summary

- BV increases the risk of LBW and PMR
- BV and prematurity are more frequent in black women and are associated
- Treatment with metronidazole/erythromycin reduces the increased risk by approximately 2/3

# Bacterial Vaginosis and HIV

- 1,196 HIV seronegative women followed antenatally and postnatally
- BV was associated with antenatal and postnatal HIV acquisition
- 23% attributable risk ascribed to BV, with risk graded to disturbance in vaginal flora
- Confirmed in Uganda-Rakai study

# Male Partner Effects?

- No male partner factor identified
- BV more common in sexually active women
- Partner treatment not indicated

# Treatment of BV: CDC Recommendations

- Metronidazole—500 mg BID x 7 days
- Metronidazole—2 g x 1 dose
- Clindamycin—300 mg BID x 7 days
- Metronidazole—0.75% vaginal gel 5 g BID x 5 days
- Clindamycin—2.0% vaginal cream 5 g QHS x 7 days

# Public Health Dilemmas and BV

- Very high prevalence and recurrence in some areas
  - Impact on syndromic STD management
- Is BV risk related to risk factors or endogenous factors?
- Impact of microbicides on BV-risk-collateral effects?

# Differential Diagnosis of Vaginal Infections

Diagnostic Criteria	Syndrome			
	Normal	Bacterial Vaginosis	Candida Vulvovaginitis	Trichomonas Vaginitis
Vaginal pH	3.8 - 4.2	> 4.5	≥ 4.5 (usually)	> 4.5
Discharge	White, clear, flocculent	Thin, homogeneous, white, gray, adherent, often increased	White, curdy, "cottage cheese" like, sometimes increased	Yellow, green, frothy adherent, increased
Amine odor (KOH "whiff" test)	Absent	Present (fishy)	Absent	Present (fishy), (not always)
Microscopic	Lactobacilli	Clue cells, coccoid bacteria, no WBC's	Mycelia, budding yeast, pseudo-hyphae w/KOH prep	Trichomonads, WBC's > 10hpf
Main patient complaints	None	Discharge, bad odor, itching may be present	Itching/burning, discharge	Frothy discharge, bad odor, vulvar pruritus, dysuria



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## Section D

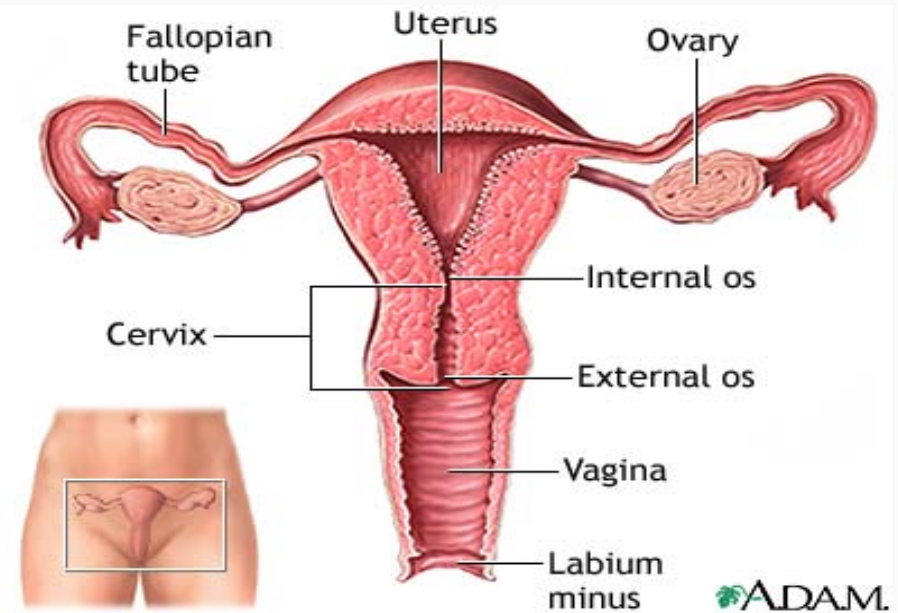
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Pelvic Inflammatory Disease (PID): The Basics

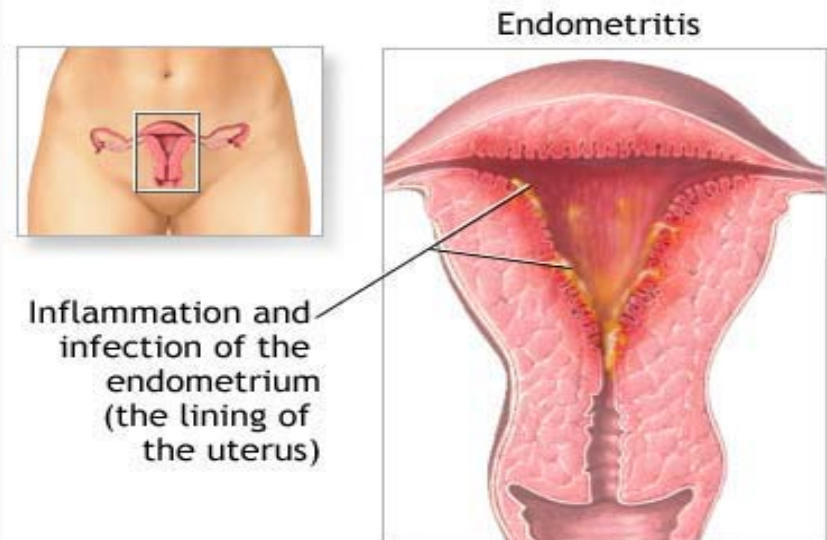


# PID

- Inflammation of upper genital tract
- **“Catch all” Term**—may include endometritis, salpingitis, tubo-ovarian abscess (TOA), and pelvic peritonitis



ADAM.



ADAM.1

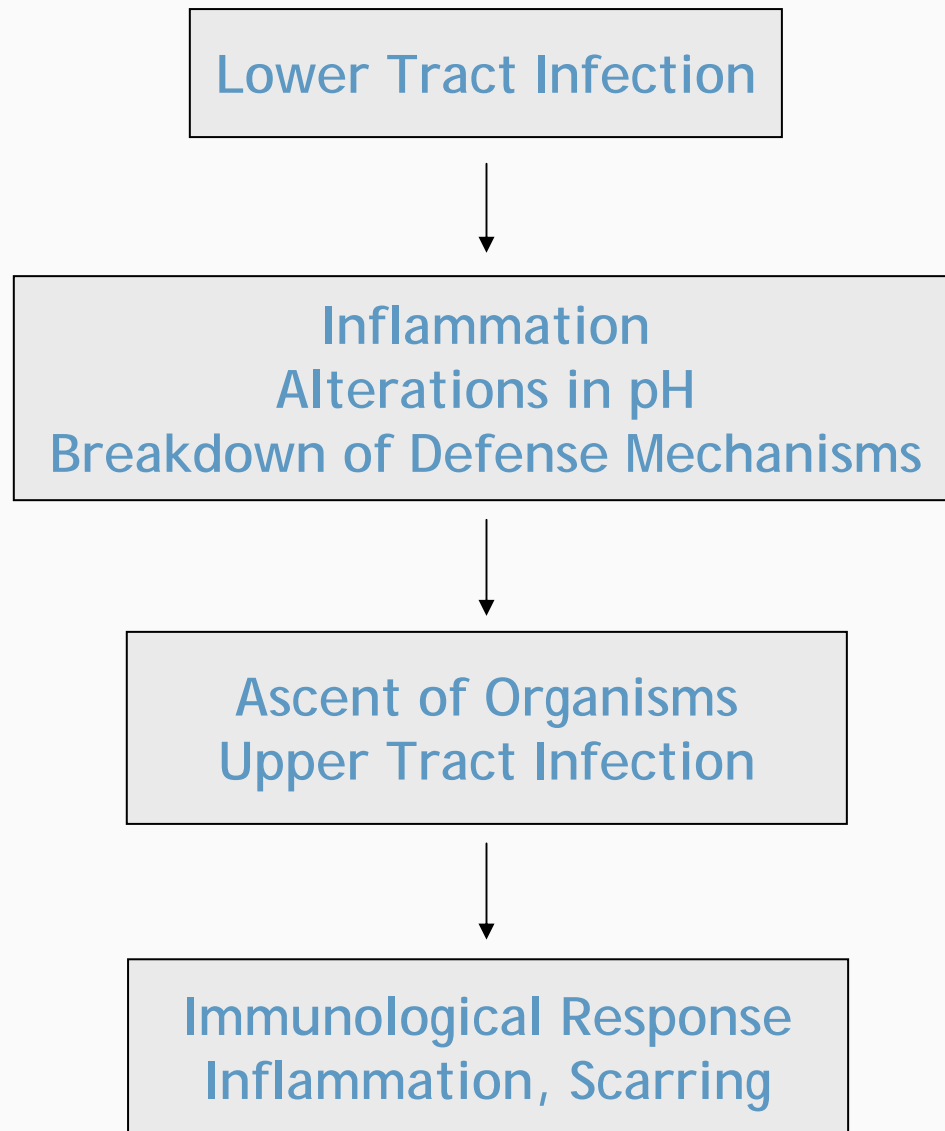
# Who Cares?

- Most important complication of STIs
- ~ 1 million women affected yearly in U.S.
- Of those, 10%-25% are hospitalized
- > 25% women suffer long-term sequelae
- Expensive to manage [10.2 billion \$/yr]

# Pathogenesis of PID

- **Theory 1** GC/CT infections cause tissue damage leading to superinfection w/ vaginal and cervical aerobes and anaerobes
- **Limitation**—GC and CT are isolated in < 50% of cases of PID
- **Theory 2** polymicrobial infection from the outset— i.e., not necessarily associated w/ GC and CT infections
- **Limitation**—why does the polymicrobial infection happen?

# PID Pathogenesis



# Mechanisms of Ascent

- Cervix (ectopy)
- Uterine contractions
- Menstruation
- Spermatozoa (“hitch-hikers”)

# PID: Etiological Agents

## Sexually Transmitted

*C. Trachomatis*

*N. Gonorrhoeae*

*Mycoplasma spp*

*Unreaplasma urealyticum*

## Endogenous

Group B streptococci

Enterobacteriaceae

Gardnerella

## Anaerobes

Lactobacilli

Actinomyces

Veilonella

Anaerobic streptococci

Bacteroides

In up to 30% of cases, no organisms identified

# Risk Factors

- Previous PID [recurrent disease in 25%]
- GC/CT infections
- BV [three-fold increased risk]
- Multiple sex partners [not lifetime number]
- Young age [70% < 25 years; 33% < 19 years]
- IUD [two-fold increased risk; actinomyces]
- Smoking
- Menses [60% develop symptoms at the end of menses]
- Douching

# Symptoms

- Lower abdominal pain
- Fever
- Abnormal discharge



# PID Diagnosis

- **Laparoscopy**—gold standard BUT (i) invasive (ii) may miss mild fallopian tube disease (iii) does not detect endometritis (iv) expensive
- **Endometrial biopsy**—may miss other involved areas [sens 39%-89%; spec 67-89% when compared to laparoscopy]
- **Clinical signs and symptoms** (more on that soon)

Important diagnostic issue

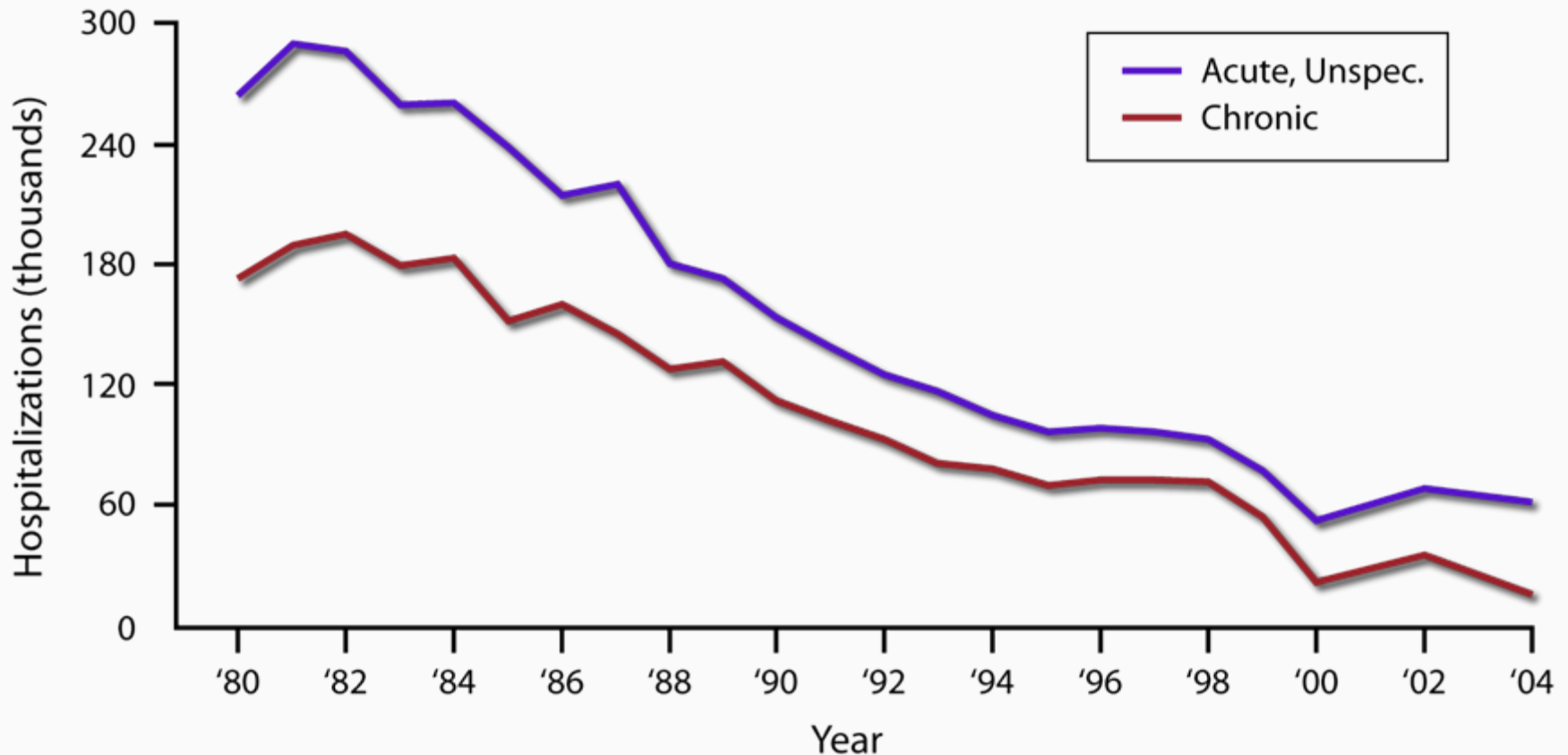


Laparoscopic Views

# PID Treatment

- Broad spectrum antibiotics effective against GC, CT, and anaerobic bacteria are recommended
  - Do we use oral or intravenous antibiotics?
- Outpatient oral therapy in > 75% of cases
  - Who gets hospitalized?
- Make sure you can follow-up outpatients in 24 hours
- For mild to moderate disease, the PEACH study demonstrated the equivalence of oral and parenteral antibiotic regimens

# PID: Hospitalization of Women 15-44 Years-of-Age



Adapted by CTLT from the National Hospital Discharge Survey (National Center for Health Statistics, CDC).



# PID Sequelae

- Tubal Factor Infertility (TFI)
- Ectopic pregnancy
- Chronic pelvic pain

# PID Sequelae: TFI

Number of Episodes of PID	N	Infertility
None	0/493	0%
1	79/991	8.0%
Mild	2/312	0.6%
Moderate	28/45	6.2%
Severe	49/229	21.4%
2	36/185	19.5%
3	26/65	40.0%

# PID Sequelae: Ectopic Pregnancy, Chronic Pelvic Pain

- 9.1% of women who have had at least one episode of laparoscopically-documented PID have had an ectopic pregnancy as their first pregnancy following their PID episode
  - *Westrom, et al. (1992) Sex Transm Dis;19: 185-192*
- Up to 33% of women have been reported to develop chronic pelvic pain following an episode of PID
  - *Ness, et al. (2002) Am J Obstet Gynecol; 186: 929-937*

# PID in HIV+ Women

- Symptoms may not be severe
- More likely to have TOA, persistent fever
- Lower WBC counts
- Treatment regimens are the same (few prospective studies)



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## Section E

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Scratching the Surface: Diagnosis



# Diagnostic Issue

- How good are we at diagnosing PID *clinically*?
  - In other words, do clinical signs and symptoms predict the presence of PID?

# PID Evaluation and Clinical Health (PEACH) Study

- Multicenter randomized clinical trial; 3/96-2/99; 831 women aged 14-37 years; recruited from ER, ObGyn clinics, and STD clinics
- Inclusion: (i) pelvic pain, (ii) bimanual tenderness, (iii) leukorrhea or MPC and/or positive GC or CT test
- Compare oral vs. IV antibiotics for treatment of PID
- The study used clinical S&S for diagnosing PID
- An endometrial biopsy was done on all women [note, < 50% of women who were ultimately enrolled were found to have endometritis]

# How Did This Diagnostic Issue Come Up?

- Up to 75% of women with post-infection tubal infertility have *no prior history of being diagnosed or treated for PID* \*
- Up to 25% of women with symptoms suggestive of PID are diagnosed with another condition altogether \*\*

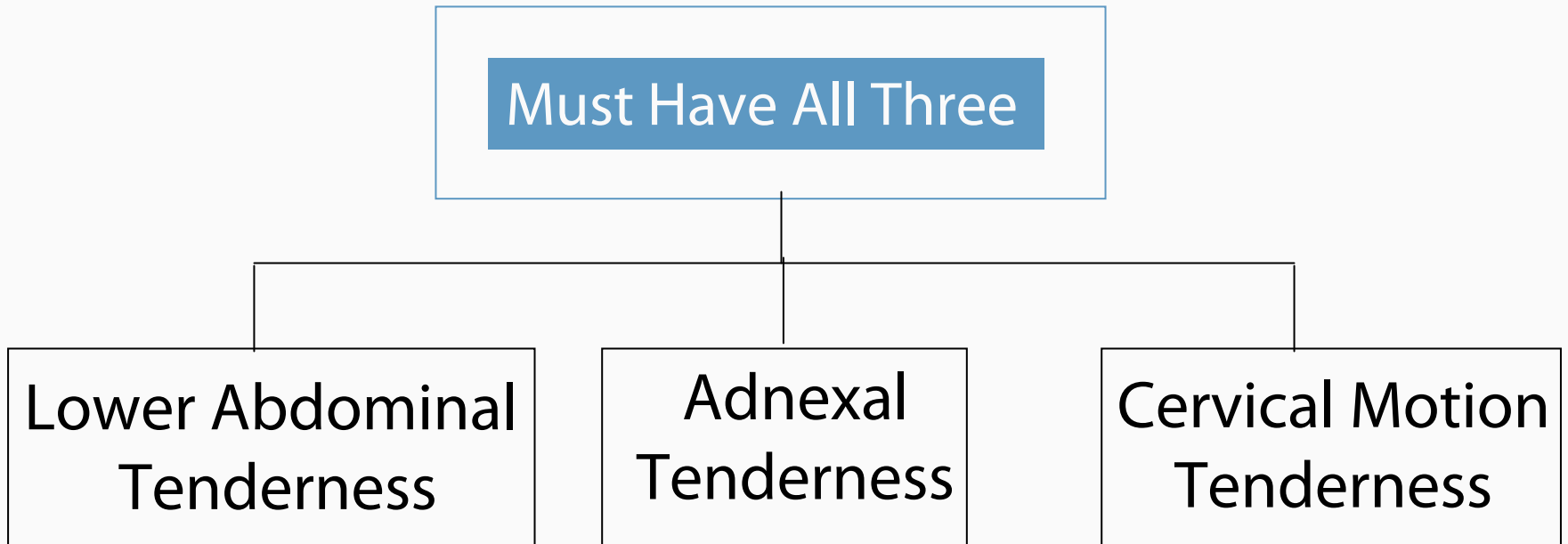
# A Short but Important Aside . . .

- Where are most of the data coming from?
- A total of six studies have evaluated signs and symptoms and used laparoscopy as the gold standard for diagnosing PID

Author (yr)	N (n+/n-)	Population
Jacobson (1969)	716 (532/184)	ObGyn
Lehtinen (1986)	35 (26/9)	ObGyn
Wasserheit (1986)	36 (22/14)	ObGyn/STD/ER
Paavonen (1989)	41 (31/10)	ObGyn
Morcos (1993)	176 (134/42)	ObGyn
Cibula (2001)	141 (43/98)	ObGyn

- For a study to be adequately powered (80%) at a minimal detectable difference of 5% between those with and those without PID, the following sample sizes are needed for the different sensitivities: sens 70% (N=646), sens 80% (N=492), sens 90% (276)

# Minimal CDC Criteria for PID Diagnosis (until 2002)



# Additional Criteria for PID Diagnosis

## Routine

- Oral temp > 38.3 C
- Abnormal discharge
- Elevated ESR
- Elevated C-reactive protein
- Lab documented GC or CT

## Elaborate

- Histologic evidence of endometritis
- Radiologic evidence on transvaginal sonogram
- Laparoscopic abnormalities

# Diagnosis of PID

## ORIGINAL ARTICLE

### Diagnosis of pelvic inflammatory disease: time for a rethink

I Simms, F Warburton, L Weström

- **Discriminant Analysis**—Three variables influenced the prediction of the presence of PID: ESR, fever, and adnexal tenderness
- These variables correctly classified 65% of pts with laparoscopically-confirmed PID

**Table 2** Prediction of laparoscopically diagnosed PID: sensitivity and specificity of signs and symptoms, likelihood ratios and post-test probabilities (pretest probability = 7.9%)

Signs and symptoms	Sensitivity (%) (95% CI)	Specificity (%) (95% CI)	Laparoscopically diagnosed PID		Likelihood ratio* (positive)	Post-test probability
			Present (n = 494) No (%)	Absent (n = 129) No (%)		
Vaginal discharge	74 (69.99 to 77.90)	24 (16.95 to 32.34)	366 (74)	98 (76)	0.98	0.79
Fever	47 (42.49 to 51.47)	64 (55.43 to 72.58)	234 (47)	47 (36)	1.30	0.83
Vomiting	14 (11.03 to 17.34)	88 (81.55 to 93.34)	68 (14)	16 (12)	1.11	0.81
Menstrual irregularity	45 (40.49 to 49.45)	57 (48.36 to 66.03)	223 (45)	56 (43)	1.04	0.80
Ongoing bleeding	25 (21.34 to 29.17)	77 (68.49 to 83.73)	124 (25)	29 (22)	1.12	0.81
Urinary symptoms	35 (30.81 to 39.41)	64 (55.43 to 72.58)	173 (35)	46 (36)	0.98	0.79
Proctitis symptoms	10 (7.43 to 12.90)	92 (86.21 to 96.22)	50 (10)	10 (8)	1.31	0.83
Tenderness of pelvic organs on bimanual examination	99 (97.65 to 99.67)	0.007 (<0.001 to 2.84)	489 (99)	128 (99)	1.00	0.79
Palpable adnexal mass or swelling	52 (47.52 to 56.51)	70 (61.06 to 77.54)	258 (52)	39 (30)	1.73	0.84
Erythrocyte sedimentation rate $\geq 15$ mm in 1st hour	81 (77.23 to 84.34)	33 (25.28 to 42.17)	402 (81)	86 (66)	1.22	0.82

\*Likelihood ratio interpretation:  $>10$  and  $<0.1$  (large difference between pretest and post-test probability), 5–10 and 0.1–0.2 (moderate), 2–5 and 0.5–0.2 (small), 1–2 and 0.05–1 (small and rarely important).<sup>14</sup>

# Diagnosing PID

- **Low threshold**
- *2006 CDC Guidelines*
  - Empiric treatment for PID should be initiated if **one** of the following minimal criteria is present and there is no other cause for the illness:
  - **Uterine/adnexal tenderness** OR **cervical motion tenderness**



# Pelvic Inflammatory Disease

## Microbiological Issues

- Representative of lower tract culture
- Does the presence (absence) of GC or CT at the cervix imply its presence (absence) in the UGT?



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## Section F

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Scratching the Surface: Sequelae and Risk Factors

# Issues with Sequelae: Tubal Factor Infertility

- Scandinavian cohort of 2,501 women recruited from 1960 to 1984 who underwent laparoscopy because of symptoms suggestive of PID
- 1844 had lap-proven PID (“cases”) and 657 did not (“controls”)
  - Note—87% of controls had evidence of an infection of the lower genital tract
- The groups were followed for 13,400 and 3,958 person-years, respectively
- 75% of subjects in both groups attempted to conceive during the follow-up period
- TFI—infertility caused by tubal occlusion verified by HSG, laparoscopy, laparotomy, or a combination

# Pelvic Inflammatory Disease and Fertility

*A Cohort Study of 1,844 Women with Laparoscopically Verified Disease and 657 Control Women with Normal Laparoscopic Results*

<b>Percentage and Number of Patients Attempting to Conceive Who Had Tubal Factor Infertility by Age, Number of PID Episodes, and Severity of PID*</b>						
	<b>Age (Years)</b>					
	<b>&lt; 25</b>		<b>• 25</b>		<b>Total</b>	
<b>Number of Episodes of PID</b>	<b>%</b>	<b>(n/N)</b>	<b>%</b>	<b>(n/N)</b>	<b>%</b>	<b>(n/N)</b>
<b>One</b>	7.7	(59/771)	9.1	(20/220)	8.0	(79/991)
<b>Mild</b>	0.8	(2/241)	0.0	(0/71)	0.6	(2/312)
<b>Moderate</b>	6.4	(23/361)	5.6	(5/89)	6.2	(28/452)
<b>Severe</b>	20.1	(34/169)	25.0	(15/60)	21.4	(49/229)
<b>Two</b>	18.4	(29/158)	25.9	(7/27)	19.5	(36/185)
<b>Three or More</b>	37.7	(23/61)	75.0	(3/4)	40.0	(26/65)
<b>Total</b>	11.2	(111/990)	12.0	(30/251)	11.4	(141/1241)
PID = Pelvic Inflammatory Disease; n = total number of cases followed; N = total number of evaluable cases						
* Excluding those with non-tubal factor infertility and with incomplete infertility examinations						

Endometritis does not predict reproductive morbidity after pelvic inflammatory disease

## Risk of Reproductive Outcomes after Endometritis or UGTI\* or No Endometritis / No UGTI among with Clinical PID

Outcome	No Endometritis / No UGTI (n = 258)		Endometritis, UGTI, or Both (n = 356)		Crude OR (95% CI)	Adjusted OR (95% CI)
	No.	%	No.	%		
<b>Pregnant</b>	103	40.2	142	40.8	1.0 (0.7–1.4)	0.8 (0.6–1.2)
<b>Infertile</b>	43	17.8	53	16.4	0.9 (0.6–1.4)	1.0 (0.6–1.6)
<b>Recurrent PID</b>	50	19.5	46	13.2	0.6 (0.4–1.0)	0.6 (0.4–0.9)
<b>CPP</b>	112	44.4	98	29.5	0.5 (0.4–0.7)	0.6 (0.4–0.9)

\* UGTI was defined as isolation of gonorrhea and / or Chlamydia from the endometrium.

\*\*Adjusted for age, PID history, race, and education. Pregnancy and infertility are additionally adjusted for reported baseline infertility (one year of unprotected intercourse without resulting pregnancy).

- **Infertility**—Defined by “lack of conception despite sexual activity with “rare” or “never” use of contraception during 12 or more months of F/U”
- **Ectopic Pregnancy**—A total of five women ONLY had an ectopic pregnancy in follow-up

## Association Between Vaginal Douching and Acute Pelvic Inflammatory Disease

¶| Walner-Hanssen, MD, DMS; David A. Eschenbach, MD; Jorma Paavonen, MD, DMS; Claire E. Stevens, MA, PA; Nancy B. Kiviat, MD; Cathy Critchlow, MS; Timothy DeRouen, PhD; Laura Koutsky, PhD; King K. Holmes, MD, PhD

- 100 consecutive symptomatic women with PID confirmed by laparoscopy or endometrial biopsy were compared with 119 symptomatic women with no evidence of PID on either laparoscopy or endometrial biopsy (internal controls) AND 762 randomly selected women without PID presenting to the STD clinic for care (external controls)

# Results

Adjusted Odds of PID	Internal Controls OR (95%CI)	External Controls OR (95%CI)
Douching compared to no douching	1.9 (1.02-3.48)	1.7 (1.04-2.82)

- Adjusted for age, race, parity, years of education, smoking, age at first intercourse, frequency of intercourse, history of GC, CT, or PID, contraception

# Issues with Risk Factors: Contraception

- **Positive association** between intrauterine devices and PID
  - Is it causative?
- **Negative association** between PID and oral contraceptive pill (OCP) use
  - Are OCPs protective?



## Decreased Risk of Symptomatic Chlamydial Pelvic Inflammatory Disease Associated With Oral Contraceptive Use

Pål Welner-Hanssen, MD, DMS; David A. Eschenbach, MD; Jorma Paavonen, MD, DMS; Nancy Kiviat, MD; Claire E. Stevens, MA, PA; Cathy Critchlow, MS; Timothy DeRouen, PhD; King K. Holmes, MD, PhD

- Contraceptive use by women [presenting for care at an STD clinic, an ObGyn clinic, or the ED] with signs and symptoms of PID [confirmed by either laparoscopy or endometrial biopsy] (cases) were compared to contraceptive use by women [presenting for care at an STD clinic] who did not have clinical signs of PID (controls)

# Results

Unadjusted OR	OR (95%CI) Overall	OR (95% CI) For CT	OR (95% CI) For GC
OC users vs. non-users	0.51 (0.34-0.90)	0.22 (0.08-0.64)	0.92 (0.31-2.63)

Adjusted OR	OR (95%CI) Overall	OR (95% CI) For CT	OR (95% CI) For GC
OC users vs. non-users	0.57 (0.31-1.04)	—	—

Sample size too small to adjust.

The authors however added one variable at a time and found no appreciable change as compared to unadjusted Ors . . .

# PID and Hormonal Contraception

- Nested case control study in the PEACH cohort—326 controls, 133 endometritis without UGTI cases, and 104 UGTI cases

## Hormonal and barrier contraception and risk of upper genital tract disease in the PID Evaluation and Clinical Health (PEACH) study

**Table III.** Odds ratios (95% confidence intervals) associated with use of oral contraception, medroxyprogesterone, condoms, other barrier methods, or mixed methods compared with no contraception in the past 4 weeks

<i>Variable</i>	<i>Endometritis without UGTI (OR [95% CI])</i>	<i>UGTI (OR [95% CI])</i>
No contraception	1.0	1.0
Oral contraceptives alone	1.3 (0.5-3.8)	1.3 (0.4-3.8)
Medroxyprogesterone alone	2.0 (0.9-4.6)	0.5 (0.1-2.4)
Condom use		
≤5/10 times	1.0 (0.5-2.2)	2.4 (1.2-4.8)
6-9 times	0.8 (0.3-1.8)	2.1 (1.0-4.4)
10/10 times	0.6 (0.3-1.5)	0.7 (0.3-1.9)
Other barrier	—	1.4 (0.1-13.8)
Mixed*	1.1 (0.5-2.4)	2.5 (1.2-5.1)

*CI*, Confidence interval.

\* Mixed = oral contraceptives and barrier (44), medroxyprogesterone and barrier (36).

# To Make Matters Slightly More Interesting:

## Hormonal contraception and risk of sexually transmitted disease acquisition: Results from a prospective study

Table III. Incidence of STDs and other genital tract conditions and multivariate association with contraceptive method\*

	Incidence per 100 person-years of follow-up (No. of cases)	Oral contraceptive pills		DMPA	
		HR (95% CI)	P	HR (95% CI)	P
<i>Chlamydia trachomatis</i>	11.1 (175)	1.8 (1.1-2.9)	.08	1.6 (1.1-2.4)	.02
<i>Neisseria gonorrhoeae</i>	16.5 (272)	1.4 (0.9-2.1)	.1	1.1 (0.8-1.6)	.5
<i>Trichomonas vaginalis</i>	26.4 (485)	0.9 (0.7-1.3)	.6	0.6 (0.4-1.0)	.04
<i>Candida</i> vaginitis	—† (818)	1.5 (1.2-1.9)	.002	1.1 (0.8-1.5)	.4
Bacterial vaginosis	—† (2984)	0.8 (0.7-1.0)	.08	0.7 (0.5-0.8)	<.001
Syphilis	2.9 (48)	0.4 (0.1-1.5)	.2	0.5 (0.2-1.4)	.2
Genital ulcer disease	6.1 (101)	0.9 (0.5-1.8)	.8	1.5 (0.8-2.7)	.2
Vaginal discharge	72.2 (1190)	1.1 (0.9-1.4)	.4	0.8 (0.6-1.0)	.08
Cervical mucopus	24.0 (395)	1.7 (1.2-2.4)	<.004	1.5 (1.0-2.2)	.05
Cervicitis	71.2 (1173)	1.8 (1.5-2.2)	<.001	1.5 (1.2-1.9)	.001
PID	18.0 (214)	0.7 (0.5-1.4)	.3	0.4 (0.2-0.7)	.001

# Pelvic Inflammatory Disease (PID): Summary

- Strongly associated with infertility, ectopic pregnancy, and chronic pelvic pain in women
- Expensive
- Effective antibiotic treatment is available
- Problems remain with diagnostics and outcome measures