QMH–KGMU | Infectious Diseases & AMR Master Blueprint

Department of Obstetrics & Gynaecology x Department of Microbiology, King George's Medical University, Lucknow

Target Learner: Second-Year Junior Resident (JR2), Queen Mary's Hospital (QMH)

Context: KGMU Interdepartmental Microbiology & AMR Quiz

Curriculum: 120-min Full Mastery / 60-min Emergency Route

Authoritative Stack: NCDC/ICMR v2.0 (2025), NACO (2024), FOGSI (2026), RCOG 64 (2024), WHO BPPL (2024)

QMH–KGMU | Infectious Diseases & Antimicrobial Resistance (AMR)

Master Crash-Course Syllabus, Clinical-Microbiology Reference & Antigravity Build Specification

- **Target Learner:** Second-Year Junior Resident (JR2), Department of Obstetrics & Gynaecology, Queen Mary's Hospital (QMH), King George's Medical University (KGMU), Lucknow.
- **Competition Context:** Interdepartmental Microbiology & AMR Quiz, organized and hosted by the Department of Microbiology, KGMU.
- **Strategic Objective:** Build a clinician-microbiologist hybrid mastery in 120 minutes (with a 60-minute emergency fallback route). Preparing solely from OBGYN textbooks fails in basic bacteriology, genetics, virology, mycology, parasitology, and phenotypic AST spotters; preparing solely from microbiology textbooks fails in clinical syndromic guidelines (ICMR/NCDC, NACO, RCOG, ACOG, FOGSI). This document bridges both worlds and serves as the **strict Source of Truth** for **Antigravity** to build the localhost interactive crash-course platform.

1. Overall Strategy & The 4-Pillar Weightage

Pillar	Weight	Mastery Requirements
1. Core Microbiology & Infectious Diseases	**25%**	Organism taxonomy, morphology, virulence factors, transmission, pathogenesis, culture media, biochemical/molecular diagnostics
2. Antimicrobial Resistance (AMR) & AST	**30%**	Genetic mechanisms, Ambler beta-lactamase classes, priority superbugs, CLSI vs. EUCAST breakpoints, phenotypic spotters, antibiograms, and stewardship
3. OBGYN Infectious Diseases	**30%**	Maternal sepsis, UTI in pregnancy, chorioamnionitis, PPROM, puerperal/post-abortal sepsis, STI/RTI, vaginitis, PID, vertical transmission & TORCH
4. Recent Developments & Quiz Intelligence	**15%**	NCDC NARS-Net 2026 Indian surveillance data, NCDC/ICMR v2.0 (Nov 2025), NACO 2024, FOGSI GCPR (Oct 2026), WHO BPPL 2024, WHO AWaRe 2025

The 8-Point Mental Template for Every Organism

Antigravity must structure every organism revision card in the app using this exact 8-point schema:

1. **What is it?** Classification, morphology, staining, and oxygen requirement.
2. **Where is it found?** Natural reservoir, normal flora status, and transmission route.
3. **How does it cause disease?** Key virulence factors (toxins, capsules, biofilms, adhesins) and pathogenesis.
4. **What disease does it cause?** Classical clinical syndromes and named associations.
5. **How do we identify it?** Specimen of choice, microscopy, selective/differential culture media, biochemicals, antigen detection, and NAAT/PCR/MALDI-TOF.
6. **What treats it?** First-line empirical and targeted antimicrobial principles.
7. **How does it resist treatment?** Intrinsic vs. acquired resistance mechanisms, key gene names, and phenotypic lab confirmation test.
8. **What is its OBGYN significance?** Pregnancy complications, genital tract syndromes, vertical transmission timing, fetal/neonatal sequelae, and teratogenicity traps.

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2. Master Timetables (120-Minute Full Route & 60-Minute Emergency Route)

A. The 120-Minute Master Timetable

- **Module 0 (00–08 min | 8 min):** Baseline & Foundational Microbiology (Cell structure, HGT, sterilization, diagnostics)
- **Module 1 (08–23 min | 15 min):** The Infectious Disease Organism Atlas (High-yield bacterial, viral, fungal, parasitic groups)
- **Module 2 (23–43 min | 20 min):** AMR Mechanisms, Ambler Classification & Superbugs (*Highest-Yield Core*)
- **Module 3 (43–58 min | 15 min):** AST Methods, CLSI/EUCAST Breakpoints, Phenotypic Spotters, Antibiograms & Stewardship
- **Module 4 (58–83 min | 25 min):** OBGYN Infectious Diseases & Syndromic Protocols (UTI, PPROM, Chorioamnionitis, Puerperal Sepsis, STI/RTI, PID, Vaginitis, TORCH)
- **Module 5 (83–98 min | 15 min):** Maternal Sepsis (RCOG 64), Infection Prevention & Clinical Microbiology Case Stems
- **Module 6 (98–110 min | 12 min):** Recent Guidelines, NCDC 2026 Indian AMR Surveillance Numbers & WHO Updates
- **Module 7 (110–120 min | 10 min):** Final Active Recall & 50-Question Rapid-Fire Buzzer Mock Quiz

B. The 60-Minute Emergency Route (If Clinical Duties Cut Study Time)

- *Do not read the first 60 minutes of the 2-hour course; use this compressed high-yield sequence:*
- **00–05 min (5 min):** Foundations (Gram-positive/negative, spore-formers, HGT, specimen-to-culture rules)
- **05–17 min (12 min):** AMR & Superbugs (Ambler classes, ESBL, AmpC, NDM, KPC, OXA-48, MRSA, VRE, CRE, CRAB, CZA + Aztreonam synergy)
- **17–27 min (10 min):** AST & Targets (Kirby-Bauer, Broth microdilution for Colistin, EUCAST "I" definition, Cefoxitin screen, D-test, mCIM/eCIM)
- **27–42 min (15 min):** OBGYN Infections (ASB/Pyelonephritis, LSCS prophylaxis, PPROM ORACLE-I trap, Puerperal sepsis, NACO STI kits, BV/VVC/TV, Syphilis, Toxoplasma, Listeria)

- **42–50 min (8 min):** Maternal Sepsis & HIC (RCOG 64 Sepsis Six, Clindamycin Eagle effect, Hand hygiene, CAUTI/CLABSI/SSI, *Candida auris* outbreak control)
- **50–56 min (6 min):** Guidelines & Indian AMR Data (NCDC/ICMR v2.0, NACO 2024, FOGSI 2026, 5 NARS-Net 2026 percentages)
- **56–60 min (4 min):** Final Recall (Rapid-fire quiz errors and drug teratogenicity traps)

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3. Comprehensive Module-by-Module Curriculum & High-Yield Fact Bank

Module 0: Baseline & Foundational Microbiology (Minutes 00–08)

- **Bacterial Architecture & Taxonomy:**
  - **Gram-Positive vs. Gram-Negative:** Thick peptidoglycan + teichoic/lipoteichoic acid (Gram-positive) vs. thin peptidoglycan + outer membrane containing Lipopolysaccharide (LPS: Lipid A = endotoxin, core polysaccharide, O-antigen) and porin channels (Gram-negative).
  - **Morphology & Oxygen Groups:** Cocci vs. bacilli vs. coccobacilli (*Listeria, Gardnerella, Haemophilus*) vs. spirochetes (*Treponema*). Obligate aerobes (*Pseudomonas, M. tuberculosis*), microaerophiles (*Campylobacter*), facultative anaerobes (*Enterobacterales, Staph, Strep*), obligate anaerobes (*Bacteroides, Clostridium, Peptostreptococcus* – lack catalase and superoxide dismutase).
  - **Spore-Formers, Acid-Fast & Atypicals:** Endospores (*Bacillus, Clostridium* – dipicolinic acid + calcium provides heat resistance; killed by autoclaving at $121^{\circ}C$ for 15 min). Acid-fast bacilli (*Mycobacterium* – mycolic acid, Ziehl-Neelsen stain; modified ZN with 1% H_2SO_4 for *Nocardia*, 0.5% for *Cryptosporidium/Cyclospora*). Cell-wall deficient atypicals (*Mycoplasma, Ureaplasma* – sterols in cell membrane; intrinsically resistant to all cell-wall active antibiotics).
  - **Virulence Structures:** Capsule (polysaccharide except *Bacillus anthracis* which is poly-D-glutamate; antiphagocytic; Quellung reaction), Flagella (motility, H-antigen), Fimbriae/Pili (adhesion, P-fimbriae in uropathogenic *E. coli*, sex pilus for conjugation), Biofilm (extracellular polymeric substance / glycocalyx shielding bacteria on prosthetic devices, catheters, and IUCDs; induces phenotypic antibiotic tolerance).
  - **Exotoxins vs. Endotoxins:** Exotoxins (secreted proteins, heat-labile, highly antigenic, converted to toxoids, specific enzymatic actions e.g., A-B toxins, superantigens like TSST-1 and Strep pyrogenic exotoxin). Endotoxins (Lipid A of Gram-negative LPS, heat-stable, poorly antigenic, no toxoids, activates macrophage TLR4 $\rightarrow$ TNF-α, IL-1, IL-6, nitric oxide $\rightarrow$ septic shock and DIC).
- **Bacterial Genetics & Horizontal Gene Transfer (HGT):**
  - **Conjugation:** Plasmid-mediated direct cell-to-cell contact via sex pilus (F-plasmid, R-plasmid). **Primary engine of multi-drug resistance spread** (e.g., ESBLs, *bla*NDM, *mcr-1*, *vanA* transfer from *Enterococcus* to *S. aureus* creating VRSA).
  - **Transduction:** Bacteriophage-mediated DNA transfer (Generalized via lytic cycle packaging accidents; Specialized via lysogenic prophage excision – encodes diphtheria toxin, cholera toxin, shiga toxin, erythrogenic toxin).
  - **Transformation:** Uptake of naked extracellular DNA from lysed bacteria (competent cells: *Streptococcus pneumoniae, Haemophilus, Neisseria*). Mosaic *penA* genes in penicillin/cephalosporin-resistant *Neisseria* and *S. pneumoniae* arise via transformation.

    - **Transposons ("Jumping Genes") & Integrons:** Mobile genetic elements that move resistance cassettes between plasmids and chromosomes.

- **Sterilization, Disinfection & Diagnostics:**
    - **Spaulding Classification:** Critical items (enter sterile tissue/vascular system → Sterilization via Autoclave, ETO, Hydrogen peroxide plasma), Semi-critical (contact mucous membranes e.g., vaginal speculums, endoscopes → High-level disinfection via 2% Glutaraldehyde or Ortho-phthalaldehyde), Non-critical (intact skin → Low/intermediate-level disinfection via 70% alcohol, quaternary ammonium, sodium hypochlorite).
    - **Diagnostic Hierarchy:** Specimen collection *before* first antibiotic dose → Direct Microscopy (Gram, ZN, wet mount, KOH, India ink, Dark-field) → Culture (Selective/Differential media) → Identification (Biochemicals, Automated VITEK-2, **MALDI-TOF MS** which identifies organisms in minutes via laser ionization of conserved ribosomal proteins) → Molecular (NAAT/PCR, CBNAAT/GeneXpert, Line Probe Assay).

Module 1: The Infectious Disease Organism Atlas (Minutes 08–23)

Study organisms by functional clinical clusters using the 5-anchor method (Morphology, Unique ID clue, Disease, Diagnostic test, Hallmark resistance):

Organism / Group	Morphology & ID Clues	Classical Clinical & OBGYN Associations	Diagnostic Test / Culture Media	Hallmark Resistance & Trap
Staphylococcus aureus	Gram+ cocci in clusters; Catalase+, Coagulase+ (bound & free); Ferments mannitol on Mannitol Salt Agar (yellow)	Mastitis/breast abscess, LSCS surgical site infection (SSI), Toxic Shock Syndrome (TSST-1), neonatal scalded skin syndrome	MSA, Baird-Parker agar; Coagulase test; Blood agar (golden-yellow β-hemolytic colonies)	**MRSA** (*mecA/mecC* → PBP2a); inducible clindamycin resistance (**D-test**); VISA (thickened cell wall) vs. VRSA (*vanA*)
CoNS (*S. epidermidis, S. saprophyticus*)	Gram+ cocci in clusters; Catalase+, Coagulase-negative	*S. epidermidis*: prosthetic/catheter biofilm (CLABSI). *S. saprophyticus*: 2nd most common cause of acute UTI in young sexually active women	**Novobiocin sensitivity**: *S. epidermidis* is Sensitive; ***S. saprophyticus* is Resistant**	Methicillin resistance (*mecA*) occurs in $>70\%$ of nosocomial *S. epidermidis*
***Streptococcus pyogenes* (Group A Strep - GAS)**	Gram+ cocci in chains; Catalase-neg; β-hemolytic; **PYR positive**	**Fulminant Puerperal Sepsis** ("childbed fever"), Necrotizing fasciitis, Streptococcal Toxic Shock Syndrome	**Bacitracin sensitive** (0.04 U disc); PYR test+; Lancefield Group A antigen	Universally **Penicillin susceptible**! Add **Clindamycin** in severe sepsis/necrotizing fasciitis to halt exotoxin synthesis (**Eagle effect**)
***Streptococcus agalactiae* (Group B Strep - GBS)**	Gram+ cocci in chains; β-hemolytic; Catalase-neg	Neonatal early-onset sepsis (<7 days: pneumonia/bacteremia) & late-onset meningitis; maternal UTI, chorioamnionitis, endometritis	**CAMP test positive** (arrowhead hemolysis with *S. aureus*); **Hippurate hydrolysis+**; **Bacitracin resistant**; **LIM broth / Granada agar** (orange-red pigment)	Universally Penicillin/Ampicillin susceptible; rising **Clindamycin & Erythromycin resistance** (25–40%) requires AST if penicillin-allergic

Organism / Group	Morphology & ID Clues	Classical Clinical & OBGYN Associations	Diagnostic Test / Culture Media	Hallmark Resistance & Trap
Enterococcus faecalis* & *E. faecium	Gram+ oval cocci in pairs/short chains; Group D; **PYR positive**	CAUTI, post-LSCS pelvic abscess, post-cephalosporin superinfection, bacterial endocarditis	Grows in 6.5% NaCl, 40% **bile**; hydrolyzes **Esculin** (black on Bile Esculin Agar); grows at $45^{\circ}C$	**Intrinsically resistant to ALL Cephalosporins**, Cotrimoxazole, and low-level Aminoglycosides. **VRE** (*vanA* vs. *vanB* – more common in *E. faecium*)
Escherichia coli	Gram-neg motile rod; Lactose fermenter (pink on MacConkey); Indole+, Methyl Red+, VP-neg, Citrate-neg (**IMViC: + + - -**)	#1 cause of Asymptomatic Bacteriuria (ASB), Cystitis, and Pyelonephritis in pregnancy (UPEC P-fimbriae); K1 capsular strain causes **Neonatal Meningitis**	MacConkey agar, CLED agar (yellow opaque colonies), Eosin Methylene Blue (EMB - **green metallic sheen**)	High **ESBL** rates (**CTX-M-15** in India); Carbapenem resistance via **NDM** or **OXA-48**; Fluoroquinolone resistance (*gyrA*)
Klebsiella pneumoniae	Gram-neg **non-motile**, heavily encapsulated rod; Mucoid pink lactose-fermenting colonies; Urease+, Citrate+ (**IMViC: - - + +**)	Complicated UTI, neonatal ICU sepsis outbreaks, ventilator-associated pneumonia, SSI	Mucoid stringy colonies on MacConkey/CLED	**Intrinsically resistant to Ampicillin** (chromosomal SHV-1); major reservoir of **ESBL, NDM-1, OXA-48-like, and KPC** carbapenemases
Proteus mirabilis	Gram-neg pleomorphic motile rod; Non-lactose fermenter; **Urease strongly positive**; Phenylalanine deaminase (PPA) positive	Struvite (magnesium ammonium phosphate / staghorn) renal calculi, alkaline encrusted cystitis	**Swarming motility** on Blood agar (Dienes phenomenon); fishy odor; H_2S positive on TSI	**Intrinsically resistant to Colistin, Polymyxin B, Nitrofurantoin, and Tetracyclines** (*Never prescribe Nitrofurantoin or Colistin for Proteus!*)
Pseudomonas aeruginosa	Gram-neg obligate aerobic non-fermenting motile rod; **Oxidase positive**; grape-like odor; produces Pyocyanin (blue-green) & Pyoverdine	ICU nosocomial pneumonia, burn wounds, CAUTI, ecthyma gangrenosum	Cetrimide agar; oxidative on Hugh-Leifson O/F medium; grows at $42^{\circ}C$	Intrinsic resistance to many beta-lactams (Ampicillin, Ceftriaxone, Ertapenem), Tigecycline, Cotrimoxazole. Acquired resistance via **OprD porin loss**, MexAB-OprM efflux, or **VIM/IMP/NDM** MBLs
Acinetobacter baumannii	Gram-neg **non-motile** coccobacillus; **Oxidase negative**, Catalase positive; strict aerobe	ICU ventilator pneumonia, CLABSI, post-neurosurgical/post-LSCS ICU sepsis	Non-lactose fermenter (though oxidizes lactose giving pale pink tint on MacConkey); negative oxidase distinguishes it from *Pseudomonas*	**CRAB** (Carbapenem-resistant *A. baumannii* via **OXA-23, OXA-24/40, OXA-58** and NDM); **Intrinsically resistant to Ertapenem & Fosfomycin**
Neisseria gonorrhoeae	Gram-neg kidney-bean intracellular diplococci; **Oxidase+**, ferments **Glucose only** (unlike *N. meningitidis* which ferments Maltose + Glucose)	Mucopurulent cervicitis, PID, Fitz-Hugh-Curtis syndrome (perihepatitis), Bartholin abscess, Ophthalmia neonatorum	**Thayer-Martin / Modified New York City medium** (Vancomycin, Colistin, Nystatin, Trimethoprim); **NAAT** is test of choice	Evolved resistance to Sulfonamides, Penicillin, Tetracyclines, Fluoroquinolones, and oral Cefixime (*mosaic penA*). Treated with high-dose **Ceftriaxone**

Organism / Group	Morphology & ID Clues	Classical Clinical & OBGYN Associations	Diagnostic Test / Culture Media	Hallmark Resistance & Trap
Chlamydia trachomatis	Obligate intracellular bacterium (lacks ATP synthesis; has Elementary Body = infectious & Reticulate Body = replicative)	D–K: #1 bacterial STI globally, mucopurulent cervicitis, silent PID, tubal factor infertility, ectopic pregnancy, neonatal inclusion conjunctivitis & staccato pneumonia. L1–L3: **LGV** (painless ulcer + painful inguinal bubo / groove sign)	**NAAT** on endocervical swab or first-catch urine; Cytoplasmic **Halberstaedter-Prowazek inclusion bodies** (glycogen-rich, stains with Lugol's iodine); McCoy cell culture	Lacks peptidoglycan → beta-lactams poorly effective (Amoxicillin only alternative in pregnancy). Treated with **Doxycycline** (non-pregnant) or **Azithromycin** (pregnancy)
Treponema pallidum	Thin corkscrew spirochete (6–15 μm); cannot be cultured on cell-free artificial media	Primary chancre (painless indurated), Secondary (condyloma lata, palmar/plantar rash), Congenital syphilis (stillbirth, non-immune hydrops, Hutchinson teeth, saber shins, snuffles)	**Dark-field microscopy** / DFA of chancre exudate; Non-treponemal (**VDRL, RPR** – cardiolipin antigen, monitors disease activity/cure) + Treponemal (**TPHA, TPPA, FTA-ABS, CLIA**)	**Zero documented Penicillin resistance!** Widely **resistant to Macrolides** (Azithromycin/Erythromycin via *23S rRNA* A2058G mutation). Pregnant penicillin-allergic patients **MUST be desensitized**
Mycoplasma genitalium	Smallest free-living bacterium; **no cell wall**; flask-shaped terminal tip	Non-gonococcal urethritis, persistent cervicitis, PID, preterm birth	**NAAT only** (extremely slow-growing in culture, taking months)	**100% intrinsic resistance to all beta-lactams**; > 50% acquired **Macrolide resistance** (*23S rRNA*) and rising fluoroquinolone resistance (*parC*)
Mycobacterium tuberculosis	Obligate aerobic, acid-fast bacillus (cord factor = trehalose dimycolate)	**Female Genital TB (FGTB)**: Fallopian tubes affected most (90–100%, lead-pipe/beaded appearance, tobacco-pouch hydrosalpinx) → Endometrium (50–80%, Asherman syndrome) → Ovaries (20%). Causes primary/secondary infertility	Pre-menstrual endometrial biopsy or menstrual blood in **MGIT 960 liquid culture** + **CBNAAT (GeneXpert MTB/RIF Ultra)**; LJ medium (rough, tough, buff colonies). *Never do D&C in suspected FGTB during active phase without coverage*	**RR-TB / MDR-TB** (*rpoB* gene = Rifampicin resistance; *katG* / *inhA* = Isoniazid resistance); Pre-XDR (MDR + Fluoroquinolone resistance); XDR-TB (Pre-XDR + Bedaquiline/Linezolid resistance)
***Clostridium* species (*C. perfringens, C. sordellii, C. tetani, C. difficile*)**	Gram+ spore-forming obligate anaerobic bacilli	*C. perfringens*: Post-abortal gas gangrene / clostridial myonecrosis (alpha-toxin = lecithinase, massive intravascular hemolysis, "mahogany" jaundice, renal failure). *C. sordellii*: Post-medical abortion (mifepristone) **afebrile Toxic Shock Syndrome** with massive **leukemoid reaction** (WBC > 50,000/μL). *C. difficile*: Antibiotic-associated pseudomembranous colitis	**Robertson's Cooked Meat (RCM) broth** (saccharolytic turns meat pink; proteolytic turns meat black); *C. perfringens* shows **Nagler reaction** on egg-yolk agar, **Target hemolysis (double zone)**, and **Stormy clot** in litmus milk. *C. difficile*: **GDH antigen + Toxin A/B EIA + NAAT**	*C. difficile* spores survive alcohol hand rub (**must wash hands with soap and water!**); treated with Oral **Vancomycin** or **Fidaxomicin**

Organism / Group	Morphology & ID Clues	Classical Clinical & OBGYN Associations	Diagnostic Test / Culture Media	Hallmark Resistance & Trap
***Candida* species (*C. albicans, C. glabrata, C. krusei, C. auris*)**	Budding yeast cells (4–6 μm); Gram-positive; forms **pseudohyphae** (except *C. glabrata* which forms only yeast buds, no pseudohyphae!)	Vulvovaginal candidiasis (VVC: thick curdy discharge, normal acidic pH 4.0–4.5, intense pruritus); ICU candidemia (*C. auris*)	Sabouraud Dextrose Agar (SDA); *C. albicans* shows **Germ tube (Reynolds-Braude phenomenon)** in human serum at 37°C and **Chlamydospores** on Cornmeal agar. **CHROMagar Candida:** *C. albicans* = light green, *C. tropicalis* = metallic blue, *C. krusei* = fuzzy pink	***Candida krusei* is intrinsically resistant to Fluconazole**; *C. glabrata* (*Nakaseomyces glabratus*) has high dose-dependent/acquired azole resistance. ***Candida auris*** is MDR (90% Fluconazole resistant, 30% Amphotericin resistant; DOC = **Echinocandins**)
Opportunistic Fungi (*Cryptococcus, Aspergillus*)	*Cryptococcus neoformans*: Encapsulated yeast (**India Ink** negative stain halo, Urease+, Latex agglutination CrAg). *Aspergillus fumigatus*: Septate hyphae with 45° **dichotomous branching**	Meningitis in HIV/pregnancy (*Cryptococcus*); invasive pulmonary infection in neutropenia (*Aspergillus* – Galactomannan antigen test)	SDA without cycloheximide; CrAg lateral flow assay	**Cryptococcus is intrinsically resistant to Echinocandins** (Caspofungin/Micafungin)! Treated with Liposomal Amphotericin B + Flucytosine

Organism / Group	Morphology & ID Clues	Classical Clinical & OBGYN Associations	Diagnostic Test / Culture Media	Hallmark Resistance & Trap
Viruses & Parasites	**HSV-1/2** (Tzanck smear multinucleated giant cells, viral PCR), **HPV** (16, 18 = E6 degrades p53, E7 degrades Rb; 6, 11 = condyloma acuminata; koilocytes), **HIV, HBV, HCV, CMV** ("Owl's eye" intranuclear inclusion), **Rubella, Parvovirus B19** (erythema infectiosum, targets erythroid precursors via **P-antigen / globoside** ⟶ fetal aplastic crisis & non-immune hydrops), **Dengue** (NS1 antigen first 5 days, IgM capture ELISA after day 5). Parasites: ***Plasmodium falciparum*** (placental sequestration via **VAR2CSA** binding to placental **Chondroitin Sulfate A**), ***Toxoplasma gondii***, ***Trichomonas vaginalis***	Covered in detail in Module 4	Covered in Module 4	Antiviral/antiparasitic resistance & pregnancy selection rules in Module 4

Module 2: Antimicrobial Resistance — Mechanisms, Beta-Lactamases & Superbugs (Minutes 23–43)

A. Standardized Surveillance Vocabulary (Magiorakos et al. / ECDC-CDC Consensus)

- **Intrinsic Resistance:** Innate structural or functional trait universally shared within a bacterial species (e.g., *Mycoplasma* lacking a cell wall ⟶ beta-lactam resistant; *Enterococcus* having low-affinity PBPs ⟶ cephalosporin resistant; anaerobic bacteria lacking oxidative transport ⟶ aminoglycoside resistant; Gram-negatives having an outer membrane impermeable to large glycopeptides ⟶ vancomycin resistant).
- **Acquired Resistance:** Emerges via chromosomal point mutation or Horizontal Gene Transfer (plasmids, transposons, integrons).
- **MDR (Multidrug-Resistant):** Non-susceptible to ≥ 1 agent in ≥ 3 **antimicrobial categories**.
- **XDR (Extensively Drug-Resistant):** Non-susceptible to ≥ 1 agent in **all but** ≤ 2 **antimicrobial categories** (i.e., bacterial isolate remains susceptible to only 1 or 2 categories).
- **PDR (Pandrug-Resistant):** Non-susceptible to **all agents in all antimicrobial categories** tested.

B. The 5 Core Biochemical Mechanisms of AMR & Target Map

Antibiotic Class	Cellular Target	Primary Mechanism of Resistance	Key Genetic / Biochemical Determinants
Beta-Lactams (Penicillins, Cephalosporins, Carbapenems, Monobactams)	Penicillin-Binding Proteins (PBPs) / Peptidoglycan transpeptidation	**1. Enzymatic Drug Inactivation** (Gram-negatives) **2. Target Modification** (Gram-positives & *Neisseria*) **3. Porin Loss / Efflux**	Beta-lactamases (Ambler A–D); altered **PBP2a** (*mecA/mecC* in MRSA); mosaic *penA* (*N. gonorrhoeae, S. pneumoniae*); **OprD porin loss** (*Pseudomonas* imipenem resistance)
Glycopeptides (Vancomycin, Teicoplanin)	D-Ala-D-Ala terminus of peptidoglycan pentapeptide precursor	**Target Modification** (D-Ala-D-Ala mutated to **D-Ala-D-Lac** or D-Ala-D-Ser, dropping binding affinity 1000-fold)	***vanA*** (high-level resistance to BOTH Vancomycin & Teicoplanin) vs. ***vanB*** (resistant to Vancomycin, **susceptible to Teicoplanin**)
Aminoglycosides (Gentamicin, Amikacin, Tobramycin)	**30S ribosomal subunit** (irreversible binding, misreading of mRNA)	**Enzymatic Inactivation** (Acetyltransferases AAC, Phosphotransferases APH, Nucleotidyltransferases ANT) or **16S rRNA methyltransferases**	**ArmA / RmtB** (16S rRNA methylases often co-carried on **NDM-1 plasmids** in India, conferring pan-aminoglycoside resistance)
Tetracyclines & Glycylcyclines (Doxycycline, Tigecycline)	**30S ribosomal subunit** (blocks aminoacyl-tRNA entry at A-site)	**Active Efflux Pumps** or Ribosomal Protection Proteins	***tetA, tetB*** (major facilitator superfamily efflux pumps); ***tetM, tetO*** (ribosomal protection)
Macrolides, Lincosamides, Streptogramins (MLS_B**)** (Erythromycin, Azithromycin, Clindamycin)	**50S ribosomal subunit** (23S rRNA peptidyl transferase center)	**1. Target Methylation** (23S rRNA methylase) **2. Active Efflux**	***erm* gene** (Erythromycin ribosome methylase ⟶ cross-resistance to Macrolides, Clindamycin & Streptogramin B; constitutive or inducible on **D-test**). ***mefA* gene** (efflux pump ⟶ resistant to Macrolides ONLY; Clindamycin remains susceptible / D-test negative)
Oxazolidinones (Linezolid)	**50S subunit** (23S rRNA – prevents 70S initiation complex formation)	Target mutation or rRNA methylation	*23S rRNA* G2576T point mutation or plasmid-borne ***cfr* gene** (chloramphenicol-florfenicol resistance methyltransferase)
Fluoroquinolones (Ciprofloxacin, Levofloxacin, Moxifloxacin)	**DNA Gyrase** (Topoisomerase II: *gyrA/gyrB*) & **Topoisomerase IV** (*parC/parE*)	**1. Target Site Mutation** (QRDR region) **2. Plasmid-Mediated Quinolone Resistance (PMQR)**	Chromosomal *gyrA* + *parC* mutations; ***qnrA/B/S*** (pentapeptide proteins protecting gyrase); ***aac(6')-Ib-cr*** (bifunctional enzyme acetylating both aminoglycosides and ciprofloxacin!)
Folate Pathway Inhibitors (Sulfonamides + Trimethoprim)	Dihydropteroate synthase (**DHPS**) & Dihydrofolate reductase (**DHFR**)	**Metabolic Bypass / Target Overproduction** (acquisition of drug-insensitive bypass enzymes)	***sul1, sul2*** (altered DHPS); ***dfrA*** (altered DHFR)
Polymyxins (Colistin / Polymyxin E, Polymyxin B)	Negatively charged **Lipid A** of Gram-negative LPS outer membrane	**Target Modification** (addition of positively charged phosphoethanolamine or L-Ara4N to Lipid A, repelling cationic colistin)	Plasmid-borne ***mcr-1* to *mcr-10*** (mobilized colistin resistance) or chromosomal **mgrB / PmrAB / PhoPQ** mutations in *Klebsiella*
Antitubercular Drugs (Rifampicin, Isoniazid)	Rifampicin: DNA-dependent **RNA Polymerase** (β-subunit). INH: **Mycolic acid synthesis** (InhA enoyl-ACP reductase)	Point mutations (zero horizontal plasmid transfer in *M. tuberculosis*!)	Rifampicin: ***rpoB*** gene (81-bp RRDR core detected by GeneXpert). INH: ***katG*** (catalase-peroxidase fails to activate prodrug; high-level resistance) or ***inhA* promoter** (low-level resistance, cross-resistance with Ethionamide)

C. The Ambler Classification of Beta-Lactamases (Guaranteed Quiz Matrix)

Ambler Class	Active Site	Key Enzyme Families	Substrates Hydrolyzed	Spared Beta-Lactams	Inhibited By	Key Clinical & Indian Epidemiology Notes
Class A (Penicillinases, ESBLs, Serine Carbapenemases)	**Serine**	**TEM-1, SHV-1** (narrow); **CTX-M-15**, TEM/SHV mutants (**ESBLs**); **KPC** (Carbapenemase)	**ESBLs:** Penicillins, 1st/2nd/3rd/4th-gen Cephalosporins, & **Aztreonam**. **KPC:** All beta-lactams including Carbapenems	**ESBLs spare: Carbapenems** & **Cephamycins** (Cefoxitin, Cefotetan). **KPC spares:** None	**ESBLs:** Clavulanate, Sulbactam, Tazobactam. **KPC: Avibactam, Vaborbactam, Relebactam** (poorly inhibited by clavulanate)	**CTX-M-15** is the #1 ESBL globally and in India. KPC is dominant in the US/Europe but less common in India than NDM/OXA-48
Class B (Metallo-Beta-Lactamases - **MBLs**)	**Zinc (Zn^{2+}) ion(s)**	**NDM-1** (New Delhi MBL), **VIM**, **IMP**	Penicillins, ALL Cephalosporins, Cephamycins, & **Carbapenems**	**AZTREONAM** (Monobactams are NOT hydrolyzed by Class B MBLs!)	**EDTA** or Dipicolinic acid (*in vitro* chelators). **NOT inhibited** by Clavulanate, Tazobactam, Avibactam, Vaborbactam, or Relebactam!	**#1 Carbapenemase in India** (*E. coli* & *Klebsiella*). Because NDM isolates co-carry ESBLs/OXA-48 that destroy Aztreonam, treat with **Ceftazidime-Avibactam + Aztreonam**
Class C (AmpC Cephalosporinases)	**Serine**	Chromosomal **AmpC** (**SPACE / SPICE-M** bugs: *Serratia, Pseudomonas, Indole+ Proteus/Providencia, Citrobacter, Enterobacter, Morganella*) or Plasmid AmpC (**CMY-2, DHA, FOX**)	Penicillins, 1st/2nd/3rd-gen Cephalosporins, & **Cephamycins (Cefoxitin resistant!)**	**Cefepime** (4th-gen zwitterion penetrates rapidly and is stable to AmpC) & **Carbapenems**	**Cloxacillin** or ** Phenylboronic acid** (*in vitro*). **NOT inhibited** by Clavulanate (Clavulanate actually *induces* chromosomal AmpC!), **Inhibited by Avibactam**	QUIZ TRAP **Quiz Trap:** An *Enterobacter cloacae* isolate looks sensitive to Ceftriaxone on Day 1, but therapy fails on Day 4 because Ceftriaxone derepresses chromosomal AmpC. Use **Cefepime**!
Class D (Oxacillinases)	**Serine**	**OXA-48-like** (OXA-181, OXA-232 in *Enterobacterales*); **OXA-23, OXA-24/40, OXA-58** (in *Acinetobacter*)	Penicillins, Beta-lactam/inhibitor combos (Piperacillin-Tazobactam resistant), and weak/moderate hydrolysis of **Carbapenems**	Pure OXA-48 spares 3rd-gen Cephalosporins (unless co-producing ESBL, which occurs in > 80% of cases)	**Avibactam** inhibits OXA-48-like enzymes! Not inhibited by Clavulanate, Tazobactam, Vaborbactam, or EDTA	**High-level Temocillin resistance** (MIC $> 128\ \mu g/mL$) is a classic phenotypic marker of OXA-48. In Indian *Klebsiella*, **OXA-48 + NDM co-production** is widespread

D. Intrinsic Colistin Resistance Mnemonic (Never Give Colistin/Polymyxin B To These!)

- MNEMONIC **Mnemonic — "PPM-SBN"**: ***P****roteus*, ***P****rovidencia*, ***M****organella*, ***S****erratia marcescens*, ***B****urkholderia cepacia complex*, ***N****eisseria* (plus all Gram-positives and anaerobes).

Module 3: AST Methods, CLSI/EUCAST Breakpoints, Phenotypic Spotters & Stewardship (Minutes 43–58)

A. Antimicrobial Susceptibility Testing (AST) Standards & Methods

- **Current Reference Standards (2026):**
  - **CLSI M100 (36th Edition, 2026)** and **EUCAST Breakpoint Tables v16.1 (2026)**.
  - **Critical Quiz Rule:** Never mix CLSI and EUCAST zone diameters or MIC breakpoints.
  - **The EUCAST "I" Revolution:**
    - In **CLSI**, **I** = **Intermediate** (buffer zone of uncertain therapeutic effect or active where drug physiologically concentrates, e.g., urine; CLSI also uses **SDD = Susceptible-Dose Dependent** for drugs like Cefepime).
    - In **EUCAST**, **I** = **Susceptible, Increased Exposure** (high likelihood of therapeutic success when exposure is increased by high dosing, prolonged infusion, or physiological concentration at the site of infection).
- **Standardized AST Technical Parameters (Kirby-Bauer Disk Diffusion):**
  - **Medium: Mueller-Hinton Agar (MHA)** poured to a uniform depth of $4\ \text{mm}$, $\text{pH}\ 7.2–7.4$. (If for *S. pneumoniae* or fastidious Streptococci: MHA + 5% Defibrinated Sheep Blood).
  - **Cation Adjustment:** Divalent cations (Ca^{2+} and Mg^{2+}) in Cation-Adjusted Mueller-Hinton Broth (CAMHB) are critical for **Aminoglycoside** (against *Pseudomonas*) and **Daptomycin** testing. Excess cations falsely increase aminoglycoside MICs; deficient Ca^{2+} causes Daptomycin to appear falsely resistant.
  - **Inoculum: 0.5 McFarland turbidity standard** ($\approx 1.5 \times 10^8\ \text{CFU/mL}$), incubated at $35 \pm 2^{\circ}\text{C}$ in ambient air for $16–18\ \text{hours}$ ($24\ \text{hours}$ required to detect Cefoxitin/Vancomycin resistance in Staphylococci/Enterococci).
- **Why Disk Diffusion & E-Test are BANNED for Colistin & Vancomycin (in *S. aureus*):**
  - **Colistin AST:** Because Colistin is a large, cationic lipopeptide that binds to plastic and diffuses poorly through agar, Kirby-Bauer disk diffusion, E-test strips, and automated cards are unreliable. **CLSI/EUCAST Gold Standard for Colistin: Broth Microdilution (BMD)** in plain polystyrene trays without surfactant (polysorbate-80), or **Colistin Broth Disk Elution (CBDE)**.
  - **VISA vs. VRSA Detection:** Kirby-Bauer disk diffusion **cannot** detect VISA (Vancomycin-Intermediate *S. aureus*, MIC $4–8\ \mu\text{g/mL}$). **Broth Microdilution MIC** is mandatory.

B. High-Yield Phenotypic AST Lab Spotters (How the Lab Confirms Resistance)

1. **Cefoxitin $30\ \mu\text{g}$ Disk Screen (MRSA Surrogate):**
   - *Why Cefoxitin instead of Oxacillin?* Cefoxitin is a much stronger inducer of the *mecA* (and *mecC*) gene expression in *S. aureus* and CoNS. Zone $\leq 21\ \text{mm}$ in *S. aureus* = **MRSA** (report resistant to all beta-lactams except fifth-generation anti-MRSA cephalosporins **Ceftaroline** and **Ceftobiprole**).
2. **The D-Test (Inducible Clindamycin Resistance in *Staphylococcus* & β-hemolytic *Streptococcus*):**

- Place an **Erythromycin (15 μg)** disk and a **Clindamycin (2 μg)** disk 15–26 mm apart edge-to-edge on MHA.
- **Positive D-Test:** Blunting/flattening of the Clindamycin zone of inhibition facing the Erythromycin disk (forming a letter "D").
- **Mechanism:** Erythromycin diffuses out and induces the ***erm* gene** (23S rRNA methylase).
- **Clinical Action:** Even though Clindamycin looks susceptible on its own side, **report Clindamycin as RESISTANT** (using Clindamycin clinically risks rapid selection of constitutive *erm* mutants and therapeutic failure).

3. **Phenotypic ESBL Detection (CLSI Combined Disk Test & Double Disk Synergy Test):**
   - **Screening:** Reduced zone/elevated MIC to Cefpodoxime, Ceftazidime, Aztreonam, Cefotaxime, or Ceftriaxone.
   - **CLSI Confirmatory Combined Disk Test:** Compare **Ceftazidime (30 μg)** alone vs. **Ceftazidime-Clavulanate (30/10 μg)**, AND **Cefotaxime (30 μg)** alone vs. **Cefotaxime-Clavulanate (30/10 μg)**.
   - **Positive Result:** A $\geq$ 5 mm **increase** in zone diameter (or $\geq$ 3 two-fold dilution decrease in MIC) with Clavulanic acid confirms **ESBL**.
   - **DDST (Jarlier Method):** Place Amoxicillin-Clavulanate disk in the center and 3rd-gen Cephalosporin disks 20–30 mm away $\rightarrow$ **"Keyhole" or "Champagne-cork"** expansion of the inhibition zone toward the central clavulanate disk.

4. **Carbapenemase Detection & Differentiation: mCIM vs. eCIM & Carba NP:**
   - *Note: The old Modified Hodge Test (MHT) is obsolete and removed from CLSI due to false positives with AmpC/ESBL + porin loss.*
   - **Carba NP Test:** Colorimetric rapid test ($<$ 2 hours). Bacterial lysate hydrolyzes imipenem $\rightarrow$ produces carboxylic acid $\rightarrow$ drops pH $\rightarrow$ **Phenol Red indicator turns from Red to Yellow**.
   - **mCIM (Modified Carbapenem Inactivation Method):** Incubate a 10 μg **Meropenem disk** in a broth suspension of the test organism for 4 hours, then place that disk onto a lawn of a pan-sensitive indicator strain (*E. coli* ATCC 25922). If the test isolate produces a carbapenemase, it destroys the meropenem in the disk $\rightarrow$ indicator *E. coli* grows right up to the disk (**Zone 6–15 mm = mCIM Positive**).
   - **eCIM (EDTA-Modified Carbapenem Inactivation Method):** Run simultaneously with mCIM by adding 5 mM **EDTA** to the second broth tube.
     - **mCIM Positive + eCIM Negative: Serine Carbapenemase** (Ambler Class A **KPC** or Class D **OXA-48**).
     - **mCIM Positive + eCIM Positive ($\geq$ 5 mm zone increase over mCIM): Metallo-Beta-Lactamase** (Ambler Class B **NDM, VIM, IMP** – EDTA chelates Zn^{2+} and restores Meropenem activity!).
     - *Trap:* If an Indian *Klebsiella* isolate co-produces **BOTH NDM and OXA-48**, the OXA-48 remains active despite EDTA, so eCIM appears falsely negative! Confirm with lateral flow immunochromatography (**NG-Test CARBA 5**) or PCR (**Xpert Carba-R**).

C. Cumulative Antibiograms, WHONET & Antimicrobial Stewardship (AMSP)

- **CLSI M39 Rules for Constructing a Hospital Cumulative Antibiogram:**
  1. Analyze and report data **at least annually**.

2. Include **only final, verified diagnostic isolates** (exclude surveillance/screening swabs!).
3. Include **only the FIRST isolate of a given species per patient** per analysis period (irrespective of body site or antimicrobial profile) to prevent duplicate-isolate bias toward resistance.
4. Include only species with ≥ 30 **isolates** tested (statistically reliable denominator).
5. Report **Percentage Susceptible (%S)** (do not lump Intermediate with Susceptible).

- **WHONET:** Free Windows-based software developed by the WHO Collaborating Centre for Surveillance of AMR (Boston) used across India's **NCDC NARS-Net** and **ICMR AMRSN** networks to standardize lab data entry and GLASS uploads.
- **AMSP Core Metrics & Strategies:**
  - **DDD (Defined Daily Dose) per 100 or 1000 patient-days** and **DOT (Days of Therapy)**: WHO standard metrics to audit hospital antibiotic consumption.
  - **Front-End (Pre-prescription authorization / Formulary restriction)** vs. **Back-End (Prospective Audit and Feedback at 48–72 hours)** – Prospective audit & feedback is more sustainable and collaborative.
  - **PK/PD Stewardship Pearls:**
    - **Beta-lactams:** Time-dependent killing ($fT_{>\text{MIC}}$) $\rightarrow$ optimize via **extended/prolonged 3-hour IV infusions** of Meropenem or Piperacillin-Tazobactam in septic shock.
    - **Aminoglycosides:** Concentration-dependent killing ($C_{\text{max}}/\text{MIC}$) + post-antibiotic effect $\rightarrow$ once-daily extended-interval dosing reduces nephrotoxicity (saturable renal cortical uptake).
    - **Vancomycin:** AUC_{24}/MIC **ratio of** $400–600$ is the primary driver of efficacy and safety.
    - **Organ-Specific Pharmacokinetic Failures (Classic Quiz Traps):**
      1. **Daptomycin NEVER works in Pneumonia** (inactivated by pulmonary surfactant).
      2. **Tigecycline NEVER works in UTI or Primary Bacteremia** (massive volume of distribution into tissues leaves subtherapeutic serum and urinary levels; carries FDA black box warning for increased all-cause mortality in severe hospital infections).
      3. **Oral Fosfomycin Trometamol & Nitrofurantoin ONLY work in Lower Uncomplicated Cystitis** (never use for Pyelonephritis or systemic sepsis due to inadequate renal parenchymal/serum levels).
      4. **Moxifloxacin does NOT achieve therapeutic urinary concentrations** (unlike Ciprofloxacin and Levofloxacin, Moxifloxacin is metabolized hepatically; never use Moxifloxacin for UTI!).

Module 4: OBGYN Infectious Diseases & Syndromic Protocols (Minutes 58–83)

*Source Hierarchy Rule: For Indian clinical management questions, prioritize **NCDC/ICMR National Treatment Guidelines v2.0 (Nov 2025)**, **NACO STI/RTI Guidelines (2024)**, and **FOGSI/ICOG GCPR (Oct 2026)** first, while cross-referencing **RCOG Green-top 64 (2024)**, **ACOG**, **WHO (2024/2025)**, and **Williams Obstetrics (26th Ed)**.*

4.1 Urinary Tract Infections in Pregnancy (Williams 26e Ch 56 | NCDC/ICMR v2.0 Sec 5 | ACOG 2023)

- **Pathophysiology in Pregnancy:** Progesterone-induced smooth muscle relaxation + mechanical compression by the enlarging dextrorotated uterus $\rightarrow$ hydroureteronephrosis (right $>$ left) and urinary stasis. Untreated Asymptomatic Bacteriuria (ASB) in pregnancy carries a $20–35\%$ **risk of progressing to acute**

pyelonephritis (reduced to 1–4% with screening and treatment) and is associated with preterm birth and low birth weight.

- **Diagnostic Thresholds:**
  - **ASB:** $\geq 10^5$ CFU/mL of a **single uropathogen** in midstream clean-catch urine in a patient without urinary symptoms. Screen all pregnant women with a **urine culture at the first prenatal visit (12–16 weeks)**; urinalysis/dipstick alone has poor sensitivity and cannot replace culture.
  - **GBS Bacteriuria Trap:** Presence of **Group B Streptococcus (GBS) in maternal urine at any colony count** is a marker of heavy maternal genital tract colonization. It **automatically mandates Intrapartum Antibiotic Prophylaxis (IAP) during labor** (no need to re-swab at 36 weeks!). However, you only treat GBS bacteriuria *at the time of detection* if the colony count is $\geq 10^5$ CFU/mL or the patient is symptomatic.
- **Antimicrobial Selection & Pregnancy Safety (NCDC/ICMR v2.0 & ACOG):**
  - **ASB & Acute Cystitis (5–7 days course; Fosfomycin is single dose):**
    - **Nitrofurantoin monohydrate/macrocrystals:** 100 mg PO BD for 5–7 days. *Traps:* Avoid at term (38–42 weeks)/labor due to neonatal hemolytic anemia (immature erythrocyte glutathione instability / G6PD deficiency); ineffective if CrCl < 30–60 mL/min or against *Proteus*.
    - **Fosfomycin trometamol:** 3 g PO single dose sachet (**Category B**; inhibits **MurA / enolpyruvyl transferase**, the very first cytoplasmic step of peptidoglycan synthesis). *Strictly for lower cystitis/ASB; never for pyelonephritis.*
    - **Oral Beta-Lactams:** Cephalexin (500 mg QID/BD), Cefuroxime (250 mg BD), or Amoxicillin-Clavulanate (625 mg TDS).
  - **Acute Pyelonephritis in Pregnancy:**
    - **Always hospitalize** for initial IV hydration and parenteral antibiotics until afebrile for 24–48 hours.
    - **Complication to watch for:** Endotoxin-mediated alveolar capillary permeability injury → **ARDS / Pulmonary Edema (1–8% of pregnant pyelonephritis patients)**, septic shock, anemia, and preterm labor.
    - **Empirical IV Regimens (NCDC/ICMR v2.0 & Williams 26e): Ceftriaxone** 1–2 g IV q24h, OR **Piperacillin-Tazobactam** 4.5 g IV q6h/q8h, OR **Cefepime** / **Ertapenem** / **Meropenem** (if history of ESBL UTI). Total duration: 10–14 days.

4.2 Obstetric Prophylaxis, Intra-Amniotic, Puerperal & Post-Abortal Infections (Williams 26e Ch 37 | NCDC/ICMR v2.0 Sec 6 | RCOG 64 2024 | ACOG)

Clinical Syndrome	Microbiology & Diagnostic Criteria	NCDC/ICMR v2.0 (2025) Regimen	ACOG / RCOG Global Standard	Critical Quizmaster Traps
LSCS Surgical Prophylaxis	Skin flora (*S. aureus, CoNS*) + ascending vaginal flora (GBS, *Enterococcus*, *E. coli*, *Ureaplasma*)	**Cefazolin** 2 g **IV** (3 g if ≥ 120 kg) within 60 min prior to skin incision. Add **Azithromycin** 500 mg **IV** for non-elective/in-labor LSCS	Identical: **Cefazolin** 2 g **IV** (3 g if ≥ 120 kg); add **Azithromycin** 500 mg **IV** for women in labor or with ruptured membranes (**C/S Trial**)	**Give BEFORE skin incision, NOT after umbilical cord clamping** (reduces endometritis & wound infection by ~ 50% without masking neonatal sepsis). Re-dose if blood loss > 1500 mL or duration > 4 hours (2 half-lives of Cefazolin)

Clinical Syndrome	Microbiology & Diagnostic Criteria	NCDC/ICMR v2.0 (2025) Regimen	ACOG / RCOG Global Standard	Critical Quizmaster Traps
3rd & 4th Degree Perineal Tear (OASIS)	Polymicrobial perineal/fecal flora (*E. coli, Bacteroides, Staph, Strep*)	Single dose **Cefoxitin / Cefotetan** OR **Cefuroxime + Metronidazole**	Single dose 2nd-gen cephalosporin (Cefotetan/Cefoxitin) or Cefazolin + Metronidazole; RCOG also supports postoperative broad-spectrum oral coverage	Reduces wound dehiscence, purulent discharge, and rectovaginal fistula by > 65%
PPROM (Latency Antibiotics, < 34 weeks**)**	Ascending *Ureaplasma urealyticum, Mycoplasma hominis*, GBS, *E. coli, Gardnerella*	**IV Ampicillin** followed by oral Amoxicillin + **Macrolide (Erythromycin or Azithromycin)**	**Ampicillin** 2 g **IV q6h + Erythromycin** 250 mg **IV q6h for 48 hours**, followed by **Amoxicillin** 250 mg **PO q8h + Erythromycin** 333 mg **PO q8h for 5 days** (Total 7 days; Azithromycin 1g PO x 1 often replaces Erythromycin)	**AMOXICILLIN-CLAVULANATE IS STRICTLY CONTRAINDICATED!** (**ORACLE I Trial**: Co-amoxiclav significantly increases the rate of neonatal **Necrotizing Enterocolitis [NEC]**)
Chorioamnionitis / Intra-amniotic Infection ("Triple I")	Ascending polymicrobial: *Ureaplasma, Mycoplasma, Gardnerella, Bacteroides*, GBS, *E. coli*. **Isolated Maternal Fever** vs. **Suspected Triple I** (Maternal fever ≥ 39.0°C once OR 38.0–38.9°C persisting 30 min + ≥ 1 of: fetal tachycardia > 160 bpm, maternal WBC > 15,000/μL, or purulent cervical discharge)	**Piperacillin-Tazobactam** 4.5 g **IV q6h/q8h** OR **Ceftriaxone + Metronidazole**	**Ampicillin** 2 g **IV q6h + Gentamicin** 5 mg/kg **IV q24h.** If patient undergoes **LSCS**, ADD anaerobic coverage (**Clindamycin** 900 mg **IV q8h** or **Metronidazole** 500 mg **IV**)	Chorioamnionitis alone is **NOT an indication for immediate emergency LSCS** (vaginal delivery is preferred unless obstetric indications exist). Only **1 additional postpartum antibiotic dose** is needed after vaginal delivery
Puerperal Sepsis & Postpartum Endometritis	**Early (**< 48h**): Group A Strep (*S. pyogenes*)** or *Clostridium perfringens*. **Typical (***Day* 2–10**):** Polymicrobial (GBS, *Enterococcus, E. coli, Bacteroides, Peptostreptococcus*). **Late (**> 14d**):** *Chlamydia trachomatis*. **#1 Risk Factor:** Cesarean delivery after prolonged labor with ruptured membranes (15–20× higher risk than vaginal birth)	**Mild/Moderate: Piperacillin-Tazobactam** OR **Ceftriaxone + Metronidazole** ± **Gentamicin.** **Septic Shock: Meropenem** 1 g **IV q8h + Vancomycin/Teicoplanin** (+ Clindamycin if toxic shock suspected)	**Gold Standard (Cochrane): Clindamycin** 900 mg **IV q8h + Gentamicin** 5 mg/kg **IV q24h** until afebrile for 24–48h (no oral step-down needed after clinical resolution!). If fever persists at 48h, **add Ampicillin** to cover **Enterococcus**	If fever persists despite triple therapy (Ampicillin + Gentamicin + Clindamycin) and pelvic abscess/hematoma is ruled out on CT → diagnose **Septic Pelvic Thrombophlebitis (SPT)** (Ovarian vein thrombosis, right > left; diagnosis of exclusion). **Eagle Effect:** Add Clindamycin + IVIG in GAS Toxic Shock

Clinical Syndrome	Microbiology & Diagnostic Criteria	NCDC/ICMR v2.0 (2025) Regimen	ACOG / RCOG Global Standard	Critical Quizmaster Traps
Septic Abortion & Post-Abortal Sepsis	Polymicrobial: *E. coli, Klebsiella, Bacteroides, Peptostreptococcus*, GBS, *S. aureus*, ***Clostridium perfringens*** (gas gangrene), ***Clostridium sordellii*** (post-mifepristone afebrile shock + WBC $> 50,000/\mu L$)	**Piperacillin-Tazobactam + Doxycycline** (or Clindamycin + Gentamicin + Ampicillin; escalate to **Meropenem + Clindamycin/Vancomycin** in septic shock) + **Urgent Uterine Evacuation (Source Control)**	Broad-spectrum IV antibiotics initiated within 1 hour + **Immediate Uterine Evacuation** after resuscitation/first antibiotic dose (do not wait 24 hours for fever to lyse!) + Tetanus prophylaxis	High-dose **Penicillin G + Clindamycin** is life-saving for *Clostridium perfringens* myonecrosis; hysterectomy is required if uterine gas gangrene/necrosis is present
Group B Streptococcus (GBS) Intrapartum Prophylaxis (IAP)	*Streptococcus agalactiae* lower vaginal-rectal swab	**Ampicillin** 2 g **IV load, then** 1 g **IV q4h** until delivery (or Penicillin G)	**Universal Screening at** 36 0/7 to 37 6/7 weeks (ACOG Committee Opinion 797; note RCOG UK uses risk-based strategy rather than universal screening). **Penicillin G** 5 MU **IV load, then** 2.5–3 MU **IV q4h**	**Indications WITHOUT waiting for 36w swab:** (1) Previous infant with invasive GBS disease, (2) **GBS bacteriuria at any count during current pregnancy**, (3) Unknown GBS status at labor with: < 37 weeks, ROM $\geq$ 18 hours, or intrapartum temperature $\geq 38.0^{\circ}C$. **Elective LSCS with intact membranes before labor does NOT need GBS IAP**, even if GBS swab is positive! **Penicillin Allergy:** Low-risk allergy $\rightarrow$ **Cefazolin**; High-risk anaphylaxis $\rightarrow$ **Clindamycin** (ONLY if isolate proven susceptible & D-test negative) or **Vancomycin**

4.3 Vaginitis, Cervicitis, PID & NACO 2024 Syndromic Management (NACO 2024 Ch 3–5 | FOGSI GCPR Oct 2026 | WHO 2024 | CDC)

A. The 3 Vaginal Discharge Syndromes Master Comparison

Feature	Bacterial Vaginosis (BV)	Vulvovaginal Candidiasis (VVC)	Trichomoniasis (TV)
Etiology & Pathogenesis	Polymicrobial dysbiosis: loss of H_2O_2-producing *Lactobacillus crispatus* replaced by ***Gardnerella vaginalis**, Fannyhessea vaginae (Atopobium vaginae), Prevotella, *Mobiluncus*** (curved anaerobic rods)	***Candida albicans*** (85–90%) vs. Non-albicans (**C. glabrata, C. krusei**) in diabetics/recurrent cases	***Trichomonas vaginalis*** (anaerobic flagellated protozoan; exists **ONLY as Trophozoite — NO cyst stage!**; possesses hydrogenosomes)

Feature	Bacterial Vaginosis (BV)	Vulvovaginal Candidiasis (VVC)	Trichomoniasis (TV)
Discharge & Symptoms	Thin, homogeneous, grayish-white coat on vaginal walls; **fishy amine odor** (worse after intercourse/menses); minimal inflammation ("vaginoisis", not vaginitis)	Thick, white, **"curdy / cottage-cheese"** adherent plaques; intense vulvar pruritus, dysuria, erythema, satellite lesions	Profuse, thin, **frothy yellowish-green** malodorous discharge; punctate mucosal hemorrhages (**"Strawberry cervix" / Colpitis macularis** in 2% naked eye, 45% on colposcopy)
Vaginal pH (Normal: 3.8–4.5)	> 4.5 (4.7–6.0)	**Normal (≤ 4.5, typically 4.0–4.5)**	> 4.5 (5.0–6.5)
10% KOH Whiff Test	**Positive** (releases volatile amines: putrescine, cadaverine, trimethylamine)	Negative	Often Positive
Microscopy & Gold Standard	**Amsel Criteria** (≥ 3 of 4: Homogeneous discharge, pH > 4.5, Positive whiff test, > 20% **Clue Cells** on saline wet mount – squamous epithelial cells with stippled, obscured borders coated by bacteria). **Lab Research Gold Standard: Nugent Score** on Gram stain (0–3 = Normal, 4–6 = Intermediate, 7–10 = BV; counts large Gram+ rods [*Lactobacillus*], small Gram-variable rods [*Gardnerella*], and curved rods [*Mobiluncus*])	10% KOH mount or Gram stain showing **budding yeast cells and pseudohyphae** (*Note: C. glabrata shows budding yeasts WITHOUT pseudohyphae!*); Culture on SDA/CHROMagar	Saline wet mount within 10–15 minutes showing **jerky/twitching motile flagellated trophozoites** (4 anterior flagella + undulating membrane + axostyle) and numerous PMNs. **Gold Standard: NAAT** (sensitivity > 95% vs. 50–60% for wet mount); Culture on **Diamond's medium / InPouch TV**
First-Line Treatment & Resistant Protocol	**Metronidazole** 500 mg **PO BD** ×7 days (or Metronidazole gel 0.75% × 5d or Clindamycin cream 2% × 7d or Secnidazole 2 g PO single dose). *Routine treatment of male sex partners is NOT recommended*	**Uncomplicated: Fluconazole** 150 mg **PO single dose** (In pregnancy: oral azoles are contraindicated in 1st trimester due to craniofacial/cardiac teratogenicity; use **Topical Clotrimazole/Miconazole for 7 days**). **Azole-Resistant (*C. glabrata / C. krusei*)**: Intravaginal **Boric acid** 600 mg **gelatin capsule daily** ×14–21 days (contraindicated in pregnancy) or Topical Nystatin / Amphotericin B / Flucytosine	**Metronidazole** 500 mg **PO BD** ×7 days (CDC/WHO preferred for women over 2g single dose due to superior cure rates) OR Tinidazole 2 g PO single dose. **MUST treat sex partners simultaneously!** **Metronidazole-Resistant TV:** Tinidazole 2 g PO daily + intravaginal Tinidazole × 14 days

B. NACO National Technical Guidelines on STI/RTI (2024) — The 7 Color-Coded Syndromic Kits

Quizmasters in Indian Medical Colleges love matching NACO Kit Numbers, Colors, syndromes, and exact drug contents:

- **Kit 1 (Grey) — Urethral Discharge / Anorectal Discharge / Cervicitis (Mucopurulent Cervical Discharge):**
  - *Pathogens: Neisseria gonorrhoeae + Chlamydia trachomatis.*
  - *Contents:* **Tab Cefixime** 400 mg **(1 tab) + Tab Azithromycin** 1 g **(1 tab)** stat. *(Note: Under updated WHO 2024 / CDC guidelines where parenteral therapy is available,* ***Inj Ceftriaxone*** 500 mg–1 g ***IM single dose*** *is preferred over oral Cefixime for gonorrhoea due to mosaic penA resistance).*

- **Kit 2 (Green) — Vaginitis (Vaginal Discharge):**
  - *Pathogens: Trichomonas vaginalis*, Bacterial Vaginosis, *Candida albicans*.
  - *Contents:* **Tab Secnidazole** 2 g **(**2 × 1 g **tabs stat) + Tab Fluconazole** 150 mg **(1 tab stat)**.
- **Kit 3 (White) — Genital Ulcer Disease - Non-Herpetic (GUD-NH):**
  - *Pathogens: Treponema pallidum* (Syphilis) + *Haemophilus ducreyi* (Chancroid).
  - *Contents:* **Inj Benzathine Penicillin** 2.4 MU **IM** (split in two buttocks) + **Tab Azithromycin** 1 g **PO stat**.
- **Kit 4 (Blue) — Genital Ulcer Disease - Non-Herpetic (Penicillin-Allergic Patients):**
  - *Contents:* **Tab Doxycycline** 100 mg **BD** ×14 days **(28 tabs) + Tab Azithromycin** 1 g **PO stat (1 tab)**. *(Crucial Quiz Trap: Kit 4 cannot replace Penicillin in pregnant women with syphilis – pregnant women MUST be desensitized and given Benzathine Penicillin!).*
- **Kit 5 (Red) — Genital Ulcer Disease - Herpetic (GUD-H):**
  - *Pathogen:* Herpes Simplex Virus (HSV-2 / HSV-1).
  - *Contents:* **Tab Acyclovir** 400 mg **TDS** ×7 days **(21 tabs)**.
- **Kit 6 (Yellow) — Lower Abdominal Pain (Pelvic Inflammatory Disease - PID):**
  - *Pathogens: N. gonorrhoeae, C. trachomatis*, Mixed Anaerobes (*Bacteroides*), Gram-negative rods, *Mycoplasma*.
  - *Contents:* **Tab Cefixime** 400 mg **stat (1 tab) + Tab Metronidazole** 400 mg **BD** ×14 days **(28 tabs) + Cap Doxycycline** 100 mg **BD** ×14 days **(28 tabs)**.
- **Kit 7 (Black) — Inguinal Bubo (LGV & Chancroid):**
  - *Pathogens: Chlamydia trachomatis* L1–L3 (Lymphogranuloma Venereum) + *Haemophilus ducreyi*.
  - *Contents:* **Cap Doxycycline** 100 mg **BD** ×21 days **(42 caps) + Tab Azithromycin** 1 g **stat (1 tab)**.

C. Classic Genital Ulcer Disease (GUD) Microbiological Spotter Matrix

Disease	Organism	Ulcer vs. Lymph Node Character	Classic Microscopy / Culture / Diagnostic Clue
Syphilis	*Treponema pallidum*	**Painless**, single, indurated ("button-like" cartilage base) chancre + **Painless** rubbery lymphadenopathy	Dark-field microscopy; VDRL/RPR + TPHA/FTA-ABS
Chancroid (Soft Sore)	***Haemophilus ducreyi***	**Painful**, ragged, non-indurated undermined ulcer with gray slough + **Painful suppurative unilateral inguinal bubo** (fluctuant, ruptures)	Gram-negative pleomorphic rods in **"School of fish" / "Railroad track"** arrangement; requires **X-factor (Hemin)** only (no V-factor)
Genital Herpes	**HSV-2 (85%) / HSV-1**	**Multiple painful grouped vesicles** on erythematous base ⟶ shallow ulcers + **Painful** tender lymphadenopathy	**Tzanck smear** (multinucleated giant cells + Cowdry Type A eosinophilic intranuclear inclusions); **HSV PCR / NAAT** (Gold standard)
Lymphogranuloma Venereum (LGV)	***Chlamydia trachomatis* Serovars L1, L2, L3**	**Painless** transient self-healing herpetiform papule/ulcer ⟶ **Painful** inguinal & femoral lymphadenopathy separated by Poupart's ligament (**"Groove sign of Greenblatt"**); late lymphatic obstruction causes **Esthiomene** (vulvar elephantiasis)	NAAT / LGV-specific real-time PCR; micro-immunofluorescence (MIF)

Disease	Organism	Ulcer vs. Lymph Node Character	Classic Microscopy / Culture / Diagnostic Clue
Granuloma Inguinale (Donovanosis)	***Klebsiella granulomatis*** (formerly *Calymmatobacterium*)	**Painless, beefy-red**, highly vascular ulcer that bleeds on touch; **NO regional lymphadenopathy** instead forms subcutaneous granulomas (**"Pseudobuboes"**)	Crushed tissue smear stained with Giemsa/Wright showing intracellular **"Donovan bodies"** (encapsulated bipolar **"Safety-pin"** rods inside large histiocytes)

4.4 STIs, Vertical Transmission & TORCH Master Pearls (Williams 26e Ch 67–68 | NACO 2024 | WHO 2024)

- **Syphilis Testing Algorithms & Congenital Syphilis:**
  - **Traditional Algorithm:** Screen with Non-treponemal test (**VDRL / RPR** ⟶ detects IgG/IgM reagin antibodies against **cardiolipin-lecithin-cholesterol**; Biological False Positives occur in pregnancy, SLE/antiphospholipid syndrome, malaria, leprosy) ⟶ Confirm with Treponemal test (**TPHA, TPPA, FTA-ABS**).
  - **Reverse Sequence Algorithm (Automated Labs):** Screen with automated Treponemal EIA/CLIA ⟶ if positive, perform quantitative **RPR** (for disease activity and monitoring 4-fold titer decline after treatment) ⟶ if RPR is discordant (negative), resolve with a second treponemal test (**TPPA**).
  - **Jarisch-Herxheimer Reaction:** Occurs within $2–24$ hours in $40–50\%$ of pregnant women treated for primary/secondary syphilis (endotoxin-like cytokine release from lysed spirochetes). In the second half of pregnancy, it can precipitate **uterine contractions, preterm labor, and transient fetal heart rate decelerations**. Manage with antipyretics, hydration, and fetal monitoring; **never withhold or delay Penicillin**.
- **HIV, HBV, HCV Perinatal Transmission:**
  - **HIV (NACO):** Universal first-line ART in pregnancy is **TLD (Tenofovir disoproxil fumarate** $300\ \text{mg}$ **+ Lamivudine** $300\ \text{mg}$ **+ Dolutegravir** $50\ \text{mg}$**)** single pill daily. Elective LSCS at 38 weeks is reserved only for maternal viral load $> 1,000\ \text{copies/mL}$ near delivery; if viral load is suppressed ($< 1,000\ \text{copies/mL}$), normal vaginal delivery is safe and recommended. Avoid artificial rupture of membranes (ARM), fetal scalp electrodes, and episiotomy.
  - **Hepatitis B (HBV):** HBeAg positivity confers $70–90\%$ vertical transmission risk (mostly intrapartum). If maternal **HBV DNA** $> 200,000\ \text{IU/mL}$ (or HBeAg positive), initiate maternal **Tenofovir (TDF)** $300\ \text{mg}$ **daily from 28 weeks gestation** + give newborn **HBV Vaccine + HBIG (**$0.5\ \text{mL}$ **IM) within 12 hours of birth** at separate thigh sites. Breastfeeding is completely safe.
  - **Hepatitis C (HCV):** Vertical transmission is $\sim 5\%$ ($\sim 10\%$ if HIV co-infected). Currently, direct-acting antivirals (DAAs) are deferred until after delivery/breastfeeding, and LSCS does not reduce HCV transmission.
- **TORCH & Perinatal Pathogens Rapid-Fire Matrix:**
  - ***Toxoplasma gondii*:**
    - *Rule:* **As gestational age increases, the risk of vertical transmission INCREASES (**15% **in 1st trimester ⟶** 65% **in 3rd trimester), whereas the severity of fetal damage DECREASES.**
    - *Classic Triad of Congenital Toxoplasmosis:* **Chorioretinitis + Hydrocephalus + Diffuse Intracranial Calcifications** (unlike CMV, which causes *periventricular* calcifications).

- *Diagnosis:* Maternal **IgG Avidity Test** (**High IgG Avidity rules out infection acquired within the past** 4 months!). Fetal diagnosis: **Amniotic fluid PCR at** $\geq$ 18 weeks **gestation** (and at least 4 weeks after maternal infection).
- *Treatment:* $<$ 18 weeks **(fetus uninfected): Spiramycin** (1 g / 3 million IU PO TDS – macrolide that concentrates in the placenta and reduces vertical transmission by 60%, but does NOT cross the placenta to cure an already infected fetus!). $\geq$ 18 weeks **OR Positive Amniotic Fluid PCR:** Switch to **Pyrimethamine + Sulfadiazine + Folinic acid (Leucovorin)**.

- **Cytomegalovirus (CMV):**
  - **#1 most common congenital viral infection globally** and **#1 infectious cause of congenital sensorineural hearing loss (SNHL)**.
  - *Hallmarks:* **Periventricular intracranial calcifications**, microcephaly, blueberry muffin rash, hepatosplenomegaly, thrombocytopenia. Confirmed in newborn by **Urine or Saliva CMV PCR within the first 21 days of life** (distinguishes congenital from postnatal breastmilk transmission). High-dose maternal **Valacyclovir** (8 g/day) is now supported in recent guidelines to reduce vertical transmission in 1st-trimester primary maternal CMV.
- **Rubella Virus:**
  - Togavirus (ssRNA). Classic Congenital Rubella Syndrome (**Gregg Triad**): **Cataracts + Sensorineural Deafness + Congenital Heart Disease (Patent Ductus Arteriosus [PDA] > Pulmonary artery stenosis)** + "Blueberry muffin" dermal erythropoiesis. MMR is a live-attenuated vaccine (**contraindicated in pregnancy**; counsel to avoid pregnancy for **4 weeks / 1 month** post-vaccination).
- **Varicella-Zoster Virus (VZV):**
  - **Fetal Varicella Syndrome** (highest risk at 13–20 weeks, ~ 2% incidence): **Cicatricial (zig-zag) skin scars in a dermatomal distribution + Limb hypoplasia + Chorioretinitis/Microphthalmia + Cortical atrophy**.
  - **Neonatal Varicella (High Mortality 20–30%):** Occurs when maternal varicella rash appears between **5 days BEFORE delivery and 2 days AFTER delivery** (transplacental viremia occurs before maternal protective IgG crosses the placenta). Give newborn **VZIG (Varicella-Zoster Immune Globulin)** immediately!
- ***Listeria monocytogenes*:**
  - Gram-positive, non-sporing, facultative intracellular rod; β-hemolytic; **Tumbling motility at** 22–25°C (room temp) vs. non-motile at 37°C (regulated by PrfA and actin rockets via **ActA** protein); **Umbrella-shaped growth** in semi-solid agar; **Cold enrichment at** 4°C.
  - Transmitted via unpasteurized soft cheeses, deli meats, unwashed raw vegetables. Causes maternal flu-like bacteremia, **brownish/meconium-stained amniotic fluid in preterm gestation**, chorioamnionitis, stillbirth, and **Granulomatosis infantiseptica** (disseminated neonatal microabscesses).
  - **Critical AMR Trap: *Listeria* is intrinsically resistant to ALL Cephalosporins!** Drug of choice is **High-Dose IV Ampicillin (2 g q4h/q6h) + Gentamicin** (or Cotrimoxazole if penicillin-allergic).

Module 5: Maternal Sepsis, Infection Prevention & Clinical Microbiology Cases (Minutes 83–98)

A. Maternal Sepsis — RCOG Green-top Guideline No. 64 (2024 Update)

- **Definition (Sepsis-3 applied to Obstetrics):** Life-threatening organ dysfunction caused by a dysregulated host response to infection occurring during pregnancy, childbirth, post-abortion, or the postpartum period (up to 42 days).
- **Why Standard MEOWS / qSOFA Requires Obstetric Calibration:** Normal physiological adaptations of pregnancy (increased heart rate, lower systemic vascular resistance/BP, tachypnea) can mask or mimic early sepsis. Use an **Obstetric Early Warning System (MEOWS)** and have a low threshold when a patient looks unwell, has unexplained fetal tachycardia (> 160 bpm), or has hypothermia ($< 36^{\circ}C$).
- **The "Golden Hour" Obstetric Sepsis Six Bundle (Execute within 1 Hour):**
  1. **Deliver High-Flow Oxygen** (target $SpO_2 > 94\%$).
  2. **Obtain Blood Cultures** (2 sets: aerobic + anaerobic from peripheral sites/lines) + source cultures (urine, high vaginal/endocervical swab, wound, placenta) **BEFORE** antibiotics—provided this does not delay antibiotic administration by > 45 minutes.
  3. **Administer Empirical Broad-Spectrum IV Antibiotics within 1 Hour** of recognition (every hour of delay in septic shock increases mortality by $\sim 7.6\%$).
  4. **Measure Serum Lactate** (≥ 2 mmol/L indicates tissue hypoperfusion; ≥ 4 mmol/L mandates aggressive resuscitation) and FBC/renal/liver/coagulation profile.
  5. **Start IV Crystalloid Fluid Resuscitation** (30 mL/kg balanced crystalloid bolus if hypotensive or lactate ≥ 4 mmol/L; use caution in pre-eclampsia to avoid pulmonary edema).
  6. **Monitor Accurate Hourly Urine Output** (catheterize) and escalate early to Senior Obstetrician + ICU/Anesthesia + Clinical Microbiologist, while arranging **Urgent Source Control** (uterine evacuation, abscess drainage, debridement).
- **RCOG 64 Red-Flag Pathogen — Invasive Group A Streptococcus (*S. pyogenes*):**
  - Can progress from mild abdominal pain/diarrhea or sore throat to fatal septic shock, disseminated intravascular coagulation (DIC), and multi-organ failure within < 12 hours.
  - **Mandatory Regimen for Invasive GAS / Toxic Shock: High-dose IV Beta-lactam (Penicillin G / Piperacillin-Tazobactam / Meropenem) PLUS IV Clindamycin (900–1200 mg q8h)** (or Linezolid). *Why Clindamycin?* In high-inoculum stationary-phase GAS infections, Penicillin fails because PBPs are downregulated (**Eagle Effect**); Clindamycin acts on the 50S ribosome to immediately shut down synthesis of M-protein and **Streptococcal Pyrogenic Exotoxins (SpeA, SpeB, SpeC)**. In refractory streptococcal/staphylococcal Toxic Shock Syndrome, administer **Intravenous Immunoglobulin (IVIG)** to neutralize circulating superantigens.

B. Hospital Infection Control (HIC) & Outbreak Microbiology (Apurba Sastry 4e & NCDC)

- **WHO 5 Moments for Hand Hygiene:**
  1. **Before** touching a patient.
  2. **Before** clean/aseptic procedures.
  3. **After** body fluid exposure risk.
  4. **After** touching a patient.

5. **After** touching patient surroundings.
   - *Hand rub vs. Hand wash:* Alcohol-based hand rub (20–30 seconds) is preferred for all routine clinical care *EXCEPT* when hands are visibly soiled or when caring for patients with **spore-forming *Clostridioides difficile*** or **Norovirus**, which require **Soap and Water (**40–60 seconds**)**.

- **Transmission-Based Precautions:**
  - **Contact Precautions:** MRSA, VRE, CRE, CRAB, ESBL, ***Candida auris***, *C. difficile*.
  - **Droplet Precautions (**$> 5\ \mu$m **droplets, travel** < 1–2 meters**, Surgical Mask):** *Neisseria meningitidis*, Diphtheria, Pertussis, Influenza, Rubella, Mumps, invasive Group A Strep.
  - **Airborne Precautions (**$< 5\ \mu$m **droplet nuclei, Negative-pressure room + N95 Respirator):** Pulmonary **Tuberculosis**, **Measles (Rubeola)**, **Varicella (Chickenpox) / Disseminated Zoster**.
- **Biomedical Waste Management (BMW Rules 2016 / 2018 Amendment — India):**
  - **Yellow Bag (Incineration / Deep burial):** Human anatomical waste (**Placenta**, fetus, tissues), soiled dressings/cotton/maternity pads contaminated with blood/body fluids, expired medicines, microbiology laboratory cultures/stocks (pre-autoclaved before disposal).
  - **Red Bag (Autoclaving / Microwaving → Recycling):** Contaminated **plastic** recyclable waste (IV sets, Foley catheters, urine bags, syringes *without* needles, vacutainers, plastic gloves).
  - **White Translucent Puncture-Proof Container (Autoclaving/Dry heat → Shredding/Encapsulation): Metals & Sharps** (Needles, lumbar puncture needles, scalpel blades).
  - **Blue Cardboard Box / Puncture-Proof Container (Disinfection → Recycling): Glassware** (broken ampoules, glass vials, slides) and metallic body implants.
- ***Candida auris* Outbreak Control Trap:** Standard quaternary ammonium hospital disinfectants are **ineffective** against *Candida auris*! Environmental decontamination requires **Sodium Hypochlorite (**$\geq$ 1000 ppm **available chlorine)** or **Hydrogen Peroxide vapor / Sporicidal EPA List P disinfectants**.

C. Three Rapid Clinical Microbiology Case Stems (How to Answer in the Quiz)

1. **Stem 1 (Post-LSCS Day 3):** 26-year-old primipara develops fever (38.9°C), tachycardia (118 bpm), lower abdominal pain, subinvoluted tender uterus, and foul-smelling lochia 72 hours after an emergency LSCS for prolonged obstructed labor.
   - *Diagnosis:* **Postpartum Endometritis**.
   - *Microbiology:* Ascending polymicrobial infection (GBS, *Enterococcus*, *E. coli*, *Gardnerella*, *Bacteroides*, *Peptostreptococcus*).
   - *Management:* Rule out sepsis (check BP, lactate, urine output), send blood cultures + urine culture, start IV **Clindamycin + Gentamicin** (or Piperacillin-Tazobactam per NCDC/ICMR v2.0). If persistent spike at 48–72h, add **Ampicillin** for *Enterococcus* and image for pelvic abscess or Septic Pelvic Thrombophlebitis.
2. **Stem 2 (24 Weeks Gestation Flank Pain):** 24-year-old G2P1 at 24 weeks gestation presents with high-grade fever with chills (39.4°C), right costovertebral angle tenderness, nausea, and tachypnea (RR 28/min, SpO_2 92%). Urine culture from another clinic 2 days ago grew *E. coli* resistant to Ceftriaxone and Ciprofloxacin, sensitive to Cefoxitin (zone 24 mm) and Meropenem, with a ≥ 5 mm zone expansion on Ceftazidime-Clavulanate disk compared to Ceftazidime alone.

- *Diagnosis:* **Acute Pyelonephritis in pregnancy complicated by early endotoxin-induced Pulmonary Edema/ARDS**, caused by an **ESBL-producing *E. coli*** (Ambler Class A, likely CTX-M-15; note Cefoxitin sensitivity rules out AmpC!).
- *Management:* Admit to HDU/ICU, oxygen support, cautious fluids, and start an IV **Carbapenem (Ertapenem** 1 g **IV q24h or Meropenem** 1 g **IV q8h)** (drugs of choice for severe invasive ESBL infections).

3. **Stem 3 (Persistent Cervicitis After Kit 1):** 29-year-old woman presents with persistent mucopurulent endocervical discharge 2 weeks after she and her partner completed oral Cefixime + Azithromycin (Kit 1). Gram stain shows $>$ 30 PMNs/hpf with no intracellular Gram-negative diplococci; Gonorrhoea and Chlamydia NAATs are negative.
   - *Diagnosis:* **Persistent Non-Gonococcal, Non-Chlamydial Cervicitis due to Macrolide-Resistant *Mycoplasma genitalium*** (or consider Cefixime-resistant *N. gonorrhoeae* if GC NAAT/culture were positive).
   - *Microbiology & Mechanism: M. genitalium* lacks a cell wall (Cefixime useless) and $>$ 50% carry *23S rRNA* mutations rendering single-dose Azithromycin ineffective.
   - *Management:* Perform *M. genitalium* NAAT + macrolide-resistance testing; treat with sequential **Doxycycline** 100 mg **BD** $\times$7 days **followed by Moxifloxacin** 400 mg **OD** $\times$7 days (if non-pregnant). If gonococcal treatment failure is suspected, obtain **endocervical Swab for Culture on Thayer-Martin medium + AST** and treat with **Ceftriaxone** 1 g **IM/IV + Gentamicin** 240 mg **IM / Azithromycin** 2 g **PO**.

Module 6: Recent Guidelines (2024–2026), Indian AMR Surveillance Numbers & WHO Updates (Minutes 98–110)

A. The Authoritative 2024–2026 Guideline Stack

Source Document & Version Date	Exact Priority Content to Cite in the Quiz
NCDC / ICMR National Treatment Guidelines for Antimicrobial Use in Infectious Diseases v2.0 (November 2025)	Primary Indian national authority for syndrome-based empirical & targeted prescribing. **Section 5:** UTIs (ASB, cystitis, pyelonephritis in pregnancy). **Section 6:** Gynaecological & Reproductive-Organ Infections (Vaginal discharge, PID, Septic abortion, Puerperal sepsis, LSCS prophylaxis)
NCDC NARS-Net AMR Surveillance Bulletin (January–June 2026)	Latest Indian national surveillance data from participating medical college laboratories across India (managed via WHONET)
FOGSI / ICOG Good Clinical Practice Recommendations (GCPR): Infections in Gynecology (1 October 2026)	Latest Indian OBGYN specialty guidance on recurrent VVC, refractory BV, PID, FGTB, and surgical prophylaxis
NACO National Technical Guidelines on STI and RTI (2024)	Indian STI syndromic management (Kits 1–7), partner management, syphilis in pregnancy, and lab diagnosis
RCOG Green-top Guideline No. 64 (2024)	*Identification and Management of Maternal Sepsis During and Following Pregnancy* (merged and replaced the older 2012 guidelines 64a and 64b)
WHO Bacterial Priority Pathogens List (BPPL 2024)	Re-categorized global priority resistant bacteria into Critical, High, and Medium tiers
WHO AWaRe Antibiotic Classification (2025 Update) & WHO GLASS Report (2025)	Current Access, Watch, and Reserve stewardship groupings (target: $\geq$ 60% **of total national/institutional antibiotic consumption from the Access group**; updated global target moving toward 70% by 2030 per UNGA 2024 declaration)

Source Document & Version Date	Exact Priority Content to Cite in the Quiz
WHO Consolidated STI Guidelines (2024)	Updated recommendations for *N. gonorrhoeae, C. trachomatis, T. pallidum*, and *T. vaginalis*
CLSI M100 (36th Edition, 2026) & EUCAST Breakpoint Tables v16.1 (2026)	Current laboratory AST breakpoints and phenotypic confirmatory test protocols

B. Five Indian AMR Numbers to Memorize (NCDC NARS-Net Bulletin, Jan–June 2026)

*Quiz Framing Rule: Always qualify these numbers as **"among reported isolates in the NCDC NARS-Net Jan–June 2026 national surveillance cohort"**—never state that a national pooled surveillance percentage equals QMH's local ward antibiogram!*

1. 36% — ***Escherichia coli*:** #1 contributor to the total priority bacterial isolate pool in NARS-Net India.
2. 23% — ***Klebsiella pneumoniae*:** #2 contributor to the priority isolate pool (together, *E. coli* and *Klebsiella* account for nearly 60% of all priority isolates).
3. ~ 80% — **ESBL / 3rd-Generation Cephalosporin Resistance in *E. coli*:** Among bloodstream (*E. coli* blood) isolates (with high co-resistance to fluoroquinolones; carbapenem resistance is significantly higher in *Klebsiella pneumoniae* [40–60%] and *Acinetobacter baumannii* [> 70–80%] than in *E. coli*).
4. ~ 60% — **MRSA (*Methicillin-Resistant Staphylococcus aureus*):** Among *S. aureus* bloodstream isolates in the surveillance network (with 0% vancomycin resistance in *S. aureus*, though Linezolid and Vancomycin remain the workhorses).
5. ~ 23% — **VRE (*Vancomycin-Resistant Enterococcus*):** Among *Enterococcus* bloodstream isolates (predominantly driven by *Enterococcus faecium* carrying *vanA*).

C. WHO Bacterial Priority Pathogens List (BPPL 2024 Update) — Exact Tiers

- **CRITICAL PRIORITY (4 Pathogens):**
  1. **Carbapenem-resistant *Acinetobacter baumannii* (CRAB)**
  2. **Carbapenem-resistant *Enterobacterales* (CRE)**
  3. **Third-generation cephalosporin-resistant *Enterobacterales* (3GCRE)**
  4. **Rifampicin-resistant *Mycobacterium tuberculosis* (RR-TB)** *(Newly integrated directly into the Critical Priority tier in 2024!)*
- **HIGH PRIORITY (7 Pathogens — Heavy OBGYN Relevance):**
  1. *Salmonella* Typhi (Fluoroquinolone-resistant)
  2. *Shigella* spp. (Fluoroquinolone-resistant)
  3. ***Enterococcus faecium* (Vancomycin-resistant - VRE)**
  4. *Pseudomonas aeruginosa* (Carbapenem-resistant - CRPA) *(Moved from Critical in 2017 to High in 2024)*
  5. Non-typhoidal *Salmonella* (Fluoroquinolone-resistant)
  6. ***Neisseria gonorrhoeae* (Third-generation cephalosporin- and/or fluoroquinolone-resistant)**
  7. ***Staphylococcus aureus* (Methicillin-resistant - MRSA)**
- **MEDIUM PRIORITY (4 Pathogens — Note the 2024 Streptococcal Additions!):**
  1. ***Group A Streptococci (Streptococcus pyogenes)* (Macrolide-resistant)** *(Newly added in 2024!)*
  2. *Streptococcus pneumoniae* (Macrolide-resistant)

3. *Haemophilus influenzae* (Ampicillin-resistant)
4. ***Group B Streptococci (Streptococcus agalactiae)*** **(Penicillin-resistant / reduced susceptibility)** *(Newly added in 2024 – huge obstetric quiz trivia point!)*

D. WHO AWaRe Classification (2025) Quick-Sort Matrix

- **ACCESS Group (First/second-line narrow-spectrum drugs with low resistance potential):**
  - **Beta-lactams:** Amoxicillin, Ampicillin, Amoxicillin-Clavulanate, Benzathine Penicillin G, Benzylpenicillin, Cloxacillin, **Cefazolin**, Cephalexin.
  - **Others: Gentamicin**, Amikacin, **Doxycycline**, **Metronidazole**, **Nitrofurantoin**, **Clindamycin**, Trimethoprim-Sulfamethoxazole (Cotrimoxazole), Chloramphenicol, Spectinomycin.
- **WATCH Group (Broader-spectrum drugs with higher resistance selection potential — primary targets for stewardship restriction):**
  - **Cephalosporins:** Cefuroxime, **Ceftriaxone**, Cefotaxime, **Cefixime**, Ceftazidime, **Cefepime**, Cefoxitin.
  - **Beta-lactam/Inhibitors & Carbapenems: Piperacillin-Tazobactam**, **Meropenem**, Imipenem-Cilastatin, Ertapenem.
  - **Macrolides, Quinolones, Glycopeptides & Others: Azithromycin**, Erythromycin, Clarithromycin, **Ciprofloxacin**, Levofloxacin, **Moxifloxacin**, **Vancomycin**, Teicoplanin, **Fosfomycin (Oral)**.
- **RESERVE Group ("Last-Resort" drugs reserved strictly for confirmed/suspected life-threatening MDR/XDR superbugs):**
  - **Polymyxins: Colistin (IV)**, **Polymyxin B**.
  - **Novel Beta-Lactam Combinations & Cephalosporins: Ceftazidime-Avibactam**, Ceftolozane-Tazobactam, Meropenem-Vaborbactam, Imipenem-Cilastatin-Relebactam, **Cefiderocol** (siderophore cephalosporin that enters via bacterial iron transport channels!), **Ceftaroline**, Ceftobiprole, **Aztreonam**.
  - **Anti-Gram-Positive & Others: Linezolid**, Tedizolid, **Daptomycin**, **Tigecycline**, Eravacycline, Omadacycline, **Fosfomycin (IV)**, Plazomicin, Dalbavancin, Oritavancin.

E. Antibiotic Teratogenicity & Neonatal Toxicity Rapid-Fire Table

Antimicrobial Agent	Pregnancy / Neonatal Contraindication & Mechanism	Classical Named Syndrome / Toxicity
Tetracyclines / Doxycycline	Chelates calcium in developing teeth & fetal long bones after 16 weeks gestation; causes maternal hepatotoxicity	**Yellow-brown discoloration of deciduous teeth**, enamel hypoplasia, depression of fetal skeletal/fibula growth, **Maternal Acute Fatty Liver**
Fluoroquinolones (Ciprofloxacin, Levofloxacin)	High affinity for avascular cartilage in immature animal models	**Fetal/neonatal arthropathy & cartilage damage** (Also avoided in G6PD deficiency)
Aminoglycosides (Streptomycin, Kanamycin, Gentamicin)	Crosses placenta and damages fetal labyrinthine hair cells	**Congenital Cranial Nerve VIII toxicity (irreversible bilateral sensorineural deafness)** & nephrotoxicity
Chloramphenicol	Neonates lack mature hepatic **UDP-glucuronosyltransferase** and have low glomerular filtration	**Gray Baby Syndrome** (ash-gray cyanosis, flaccidity, hypothermia, cardiovascular collapse)

Antimicrobial Agent	Pregnancy / Neonatal Contraindication & Mechanism	Classical Named Syndrome / Toxicity
Sulfonamides / Cotrimoxazole	**1st Trimester:** Folate antagonism. **3rd Trimester / Near Term:** Competes with unconjugated bilirubin for albumin binding sites	**1st Trimester:** Neural tube & cardiovascular defects. **At Term: Kernicterus** (bilirubin encephalopathy) & hemolysis in G6PD deficiency
Nitrofurantoin	Oxidative damage to fetal/neonatal red blood cells lacking mature glutathione reductase at term (38–42 weeks)	**Neonatal Hemolytic Anemia** & hyperbilirubinemia
Ceftriaxone (in Neonates < 28 days)	Displaces bilirubin from albumin AND forms insoluble precipitates with calcium in neonatal lungs and kidneys	**Kernicterus + Fatal Ceftriaxone-Calcium Cardiopulmonary/Renal Precipitates** (Always use **Cefotaxime** instead of Ceftriaxone in neonates!)
Systemic Fluconazole (High Dose in 1st Trimester)	Inhibits fetal lanosterol 14α-demethylase required for morphogenesis	**Brachycephaly, cleft palate, craniosynostosis, & Tetralogy of Fallot** (Single 150 mg low dose is lower risk, but topical Clotrimazole is preferred throughout pregnancy)
Metronidazole & Tinidazole	Safe across pregnancy for symptomatic BV/Trichomoniasis, though some Indian guidelines historically avoid high-dose single-bolus 2g regimens in the 1st trimester	**Metallic taste, Disulfiram-like reaction with alcohol** (inhibits aldehyde dehydrogenase)
Erythromycin (in Neonates < 1 month)	Motilin receptor agonist in neonatal pylorus	**Infantile Hypertrophic Pyloric Stenosis (IHPS)** (Azithromycin is safer)

4. The Book, Chapter & Guideline Master Index (Antigravity Grounding Map)

Tier 1: Core Microbiology Textbooks

1. **Apurba S. Sastry & Sandhya Bhat — *Essentials of Medical Microbiology* (4th Edition) & *Essentials of Antimicrobial Stewardship*:**
   - *Section 1 (General Microbiology):*
     - **Chapter 03.1:** General Bacteriology & Taxonomy
     - **Chapter 03.2:** Morphology and Physiology of Bacteria
     - **Chapter 03.3:** Laboratory Diagnosis of Bacterial Infections (Culture media, biochemicals, MALDI-TOF, NAAT)
     - **Chapter 03.4:** Bacterial Genetics (Plasmids, Conjugation, Transduction, Transformation, Transposons)
     - **Chapter 03.5: Antimicrobial Agents, Antimicrobial Resistance (AMR) & Antimicrobial Susceptibility Testing (AST)** *(Primary Core Chapter)*
     - **Chapter 03.6 & 03.7:** Bacterial Pathogenesis & Overview of Bacterial Infections
   - *Section 3 (Healthcare-Associated Infections & HIC):*
     - Modules on **CAUTI, CLABSI, VAP, Surgical Site Infections (SSI)**, Hand Hygiene, Standard & Transmission-Based Precautions, **Sterilization and Disinfection (Spaulding)**, **Biomedical Waste Management (BMW 2016/2018)**, Needle-Stick Injury (NSI), and **Antimicrobial Stewardship Program (AMSP)**.
   - *Systemic / Syndromic Microbiology Sections:*

- **Bloodstream Infections & Sepsis**
- **Urinary Tract Infections**
- **Genital Tract Infections / STI Syndromes**
- **Congenital & Perinatal (TORCH) Infections**

2. **Jawetz, Melnick & Adelberg's *Medical Microbiology* (29th Edition):**
   - *Section I:* Fundamentals of Microbiology (Chapter 7: Antimicrobial Chemotherapy)
   - *Section III:* Bacteriology (Pathogenesis, virulence factors, and clinical correlations)
   - *Section IV, V, VI:* Virology, Mycology, Parasitology
   - *Section VII:* Diagnostic Medical Microbiology and Clinical Correlation (Chapter 47: Principles of Diagnostic Medical Microbiology)

3. **Ananthanarayan and Paniker's *Textbook of Microbiology* (7th / Legacy & 11th / 12th Editions):**
   - *Part I (General Microbiology):* Ch 2 (Morphology), Ch 3 (Sterilization & Disinfection), Ch 4–6 (Culture Media, Culture Methods, Identification), Ch 8 (Bacterial Genetics), Ch 9 (Infection).
   - *Part III (Systemic Bacteriology):* Ch 22–25 (*Staphylococcus, Streptococcus, Pneumococcus, Neisseria*), Ch 28–30 (*Clostridium*, Non-sporing Anaerobes, *Enterobacteriaceae*), Ch 34 (*Pseudomonas*), Ch 39 (*Mycobacterium tuberculosis*), Ch 42–43 (Spirochetes, *Mycoplasma*), Ch 47 (*Chlamydiae*).
   - *Part IV (Virology):* General Virology, Herpesviruses, Hepatitis Viruses, HIV.
   - *Usage Rule:* Use Ananthanarayan strictly for historical eponyms, classical biochemical reactions, and legacy culture media names—**never** use it for current AST breakpoints, AMR epidemiology, or antibiotic treatment regimens.

Tier 2: Core OBGYN Textbooks

4. **Williams Obstetrics (26th Edition):** *(Note: 26th Ed is the active reference for the Nov 2026 quiz prior to the late-Nov 27th Ed release)*
   - **Chapter 37:** Puerperal Infection (Postpartum endometritis, wound infections, septic pelvic thrombophlebitis, necrotizing fasciitis, toxic shock syndrome)
   - **Chapter 56:** Renal and Urinary Tract Disorders (Asymptomatic bacteriuria, cystitis, acute pyelonephritis in pregnancy)
   - **Chapter 67:** Infectious Diseases (TORCH, CMV, Rubella, Toxoplasmosis, Varicella, Parvovirus B19, Listeria, GBS, Malaria, Dengue, Influenza)
   - **Chapter 68:** Sexually Transmitted Infections (Syphilis, Gonorrhoea, Chlamydia, HSV, HPV, HIV, Trichomoniasis, Candidiasis, Bacterial Vaginosis)

5. **Berek & Novak's Gynecology (16th Edition) / D.C. Dutta's *Textbook of Obstetrics* / Shaw's *Textbook of Gynaecology*:**
   - **Berek & Novak Ch 18:** Genitourinary Infections and Sexually Transmitted Diseases (PID, Tubo-ovarian abscess, Fitz-Hugh-Curtis syndrome, Vaginitis, Female Genital TB, Actinomycosis with IUCD).
   - **Dutta & Shaw Index Search Terms:** Urinary tract infection in pregnancy, Chorioamnionitis, PPROM, Puerperal sepsis, Septic abortion, Leucorrhoea / Vaginal discharge, Pelvic inflammatory disease, Female genital tuberculosis, TORCH.

Tier 3: Mandatory Guidelines (Read Before Textbook Treatment Tables)

1. **NCDC / ICMR National Treatment Guidelines for Antimicrobial Use in Infectious Diseases v2.0 (November 2025):** Sections 5 (UTIs) & 6 (OBGYN Infections, Septic Abortion, Puerperal Sepsis).
2. **NACO National Technical Guidelines on STI and RTI (2024):** Chapters 3 (Syndromic Case Management Kits 1–7), 4 (Etiological Management), 5 (Laboratory Diagnosis), and 6 (Special Populations / Pregnancy).
3. **FOGSI / ICOG GCPR on Infections in Gynecology (1 October 2026) & *Gyan Vahini*.**
4. **RCOG Green-top Guideline No. 64 (2024):** *Identification and Management of Maternal Sepsis During and Following Pregnancy*.
5. **ACOG Practice Bulletins & Clinical Consensus:** No. 199 (*Prophylactic Antibiotics in Labor and Delivery*), No. 797 (*Prevention of GBS Early-Onset Disease*), and Clinical Consensus No. 4 (*Urinary Tract Infections in Pregnant Individuals*, 2023).
6. **WHO Global Frameworks (2024–2025):** *WHO Bacterial Priority Pathogens List (2024)*, *WHO AWaRe Classification (2025)*, *WHO Consolidated STI Guidelines (2024)*, *WHO Global Antibiotic Resistance Surveillance Report (2025)*.
7. **CLSI M100 (36th Edition, 2026) & EUCAST Breakpoint Tables v16.1 (2026).**

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5. How to Read Efficiently: The 3-Pass Active Retrieval Method

The Three-Pass Study Loop

- **Pass 1 — Scan & Anchor (~ 30% of time):** Skim comparison matrices, bold enzyme/gene names, diagnostic gold standards, and red-flag traps. Do not read prose paragraphs linearly.
- **Pass 2 — Closed-Book Reconstruction (~ 40% of time):** Toggle the "Hide Answers / Blind Recall" switch in the localhost app. Reconstruct the chain: **Antibiotic → Cellular Target → Resistance Gene/Enzyme → Organism → Confirmatory Lab Test → Clinical Override Drug**.
- **Pass 3 — Rapid-Fire Buzzer Simulation & Error Logging (~ 30% of time):** Run through the 50-question buzzer simulator. For every missed question, read the 1-sentence explanation of why the distractor was wrong.

The Standard 10-Field Revision Card Schema

Every superbug and high-yield organism in the Antigravity app must render as an interactive card with these 10 fields:

1. **Organism / Phenotype Name** (e.g., *Klebsiella pneumoniae* [NDM + OXA-48 Co-producer])
2. **Classification & Morphology** (Gram-negative non-motile encapsulated bacillus)
3. **Culture & Biochemical ID Clues** (Mucoid pink lactose-fermenter on MacConkey; Urease+, Citrate+, Indole-neg, MR-neg)
4. **Key Virulence Factors** (Thick polysaccharide capsule [K-antigen], LPS endotoxin, fimbriae, siderophores)
5. **Classical Clinical Syndromes** (Complicated UTI, ICU sepsis, post-LSCS SSI, neonatal sepsis)
6. **Diagnostic Specimen & Gold Standard** (Blood/Urine culture → MALDI-TOF MS / VITEK-2)
7. **Resistance Mechanism & Genes** (Ambler Class B Zn^{2+}-dependent Metallo-beta-lactamase [*bla*NDM-1] + Class D [*bla*OXA-48])

8. **Lab Confirmation Test** (Carba NP+, mCIM+, Xpert Carba-R / NG-Test CARBA 5 lateral flow assay)
9. **OBGYN & Treatment Protocol** (Resistant to Meropenem and Ceftazidime-Avibactam alone; treat with **Ceftazidime-Avibactam + Aztreonam** synergy!)
10. **Common Quizmaster Trap** (When NDM and OXA-48 are co-produced in the same isolate, eCIM appears falsely negative because EDTA inhibits NDM but cannot inhibit OXA-48!)

What NOT To Do Tonight

- Do **not** read Ananthanarayan or Jawetz cover-to-cover.
- Do **not** memorize numerical zone diameters (in mm) or MIC breakpoints without specifying CLSI vs. EUCAST (focus instead on the ≥ 5 mm **delta rule** for ESBL/eCIM and the **Cefoxitin** $30\ \mu g$ screen concept).
- Do **not** present NCDC NARS-Net pooled national surveillance percentages (80% ESBL, 60% MRSA) as QMH's internal ward antibiogram.
- Do **not** confuse foreign STI regimens with NACO's color-coded syndromic kits when a question explicitly asks for the Indian National Program protocol (know both and state the distinction clearly!).

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6. Copy-Ready Master Build Brief for Antigravity

Copy and feed this entire file (or the exhaustive build prompt below) directly into **Antigravity** as its strict specification:

```
# ANTIGRAVITY SYSTEM SPECIFICATION: QMH-KGMU Infectious Diseases & AMR Master Crash-Course Portal

## 1. Role & Objective
You are building a local, high-speed, dark-mode, interactive medical quiz preparation web application ("QMH x

You must use the attached `qmh_kgmu_amr_master_source_of_truth.md` as your foundational database and supplemе

## 2. Core UI/UX & Interactive Architecture
1. **Dual-Mode Pacer Bar (120-Minute Full Route vs. 60-Minute Emergency Route):**
   - Provide a persistent top header toggle allowing the resident to switch between the **120-Minute Master T
2. **3-Pass Active Recall Toggle ("Study Mode" vs. "Blind Recall Mode"):**
   - Every table, comparison matrix, and organism card must include a global and per-card toggle that blurs/h
3. **10-Field Interactive Superbug & Organism Atlas Cards:**
   - Render dedicated, filterable 10-field revision cards (Organism, Classification, ID Clues, Virulence, Dis
     *S. aureus* (MRSA/VISA/VRSA), CoNS (*S. epidermidis* vs *S. saprophyticus*), *S. pyogenes* (GAS), *S. ag
4. **High-Contrast "Quizmaster Trap" & "Source Hierarchy" Callout Components:**
   - Highlight every clinical exception (e.g., ORACLE-I Amox-Clav NEC contraindication in PPROM; intrinsic Co
   - Display exact publication/version badges beside every clinical recommendation:
     - `NCDC/ICMR v2.0 (Nov 2025)`
     - `NCDC NARS-Net Bulletin (Jan–Jun 2026)`
     - `NACO STI/RTI (2024)`
     - `FOGSI/ICOG GCPR (Oct 2026)`
     - `RCOG Green-top 64 (2024)`
     - `ACOG (2023/2024)`
     - `WHO BPPL (2024) / WHO AWaRe (2025) / WHO STI (2024)`
     - `CLSI M100 36e (2026) / EUCAST v16.1 (2026)`

## 3. Mandatory Interactive Dashboards & Modules to Build
- **Module 0 & 1 Dashboard:** Interactive Gram/Morphology classifier, Horizontal Gene Transfer comparator (Co
- **Module 2 Dashboard (AMR & Beta-Lactamases):**
  - Interactive **Ambler Class A, B, C, D Matrix** showing active site (Serine vs <span class="katex"><span c
  - Interactive diagram explaining **Ceftazidime-Avibactam + Aztreonam synergy** for NDM + OXA-48/ESBL co-pro
  - The 5 Resistance Mechanisms & Antibiotic Target Map (*mecA/mecC, vanA vs vanB, erm vs mefA, mcr-1, gyrA/p
- **Module 3 Dashboard (AST Spotters & Stewardship):**
  - Visual Spotter Simulators for: **Kirby-Bauer on MHA** (<span class="katex"><span class="katex-mathml"><ma
  - CLSI vs EUCAST "I" (Intermediate vs Susceptible, Increased Exposure) comparator and CLSI M39 Cumulative A
- **Module 4 Dashboard (OBGYN Master Syndromic Matrix):**
  - Side-by-side toggleable table comparing **NCDC/ICMR v2.0 (2025)** vs **ACOG / RCOG / WHO / CDC** across:
  - **Vaginal Discharge Comparator:** BV (Amsel vs Nugent score, Clue cells, *Mobiluncus*) vs VVC (*C. albica
  - **NACO 2024 Color-Coded STI Kits (Kits 1 to 7)** interactive flashcard matcher + Genital Ulcer Disease di
  - **TORCH & Teratogenicity Matrix:** Toxoplasmosis (<span class="katex"><span class="katex-mathml"><math xm
- **Module 5 & 6 Dashboard (Maternal Sepsis, HIC & 2026 Indian AMR Data):**
  - RCOG Green-top 64 (2024) Sepsis Six 1-Hour Bundle checklist + Invasive Group A Strep protocol (Beta-lacta
  - **NCDC NARS-Net (Jan–June 2026) Visual Stat Cards:** <span class="katex"><span class="katex-mathml"><math
  - **WHO BPPL 2024 Tier Sorter** (Critical, High, Medium — highlighting newly elevated RR-TB and newly added
- **Module 7 Dashboard (50-Question Interdepartmental Buzzer Quiz Simulator):**
  - Build a 50-question interactive quiz engine mixing:
    - 15 Molecular AMR & AST Phenotypic Spotter Stems
    - 15 OBGYN Syndromic, STI, & Perinatal Clinical Vignettes
    - 10 Organism Identification & Culture Media Clues
    - 10 Recent Guideline (2024–2026), NCDC NARS-Net, & WHO AWaRe/BPPL Rapid-Fire Questions
  - Include score tracking, category breakdown, instant answer reveal, and a dynamic "Mistake Review Deck" th
```