Congenital Infections

Comprehensive Clinical Management Guide

Step-by-Step Diagnosis • Evidence-Based Treatment • Long-Term Follow-Up

AAP Red Book 2024 | IDSA Guidelines | CDC 2023 Recommendations

Infections Covered Today

- **HSV** - Complete algorithms
- **Syphilis** - Risk stratification
- **CMV** - Treatment criteria
- **HIV** - Prophylaxis protocols

- **Toxoplasmosis** - 1-year regimen
- **Hepatitis B** - Birth dose strategy
- **Hepatitis C** - New CDC testing

TORCH Syndrome: Pattern Recognition

Think TORCH when you see:

IUGR + Hepatosplenomegaly + Thrombocytopenia + Microcephaly

CNS
Micro/hydrocephalus, calcifications

Eyes
Chorioretinitis, cataracts

Hearing
SNHL (CMV #1 cause)

Neonatal Herpes Simplex Virus

Risk Assessment • Diagnostic Algorithm • Treatment Protocol

HSV: Maternal Risk Categories

1st Episode Primary (HSV-1/2, both IgG negative)
Risk: 60% transmission | Action: Full workup + empiric acyclovir

1st Episode Non-Primary (HSV-2, HSV-1 IgG positive)
Risk: 25% transmission | Action: Full workup + empiric acyclovir

Recurrent (Known history, same type IgG+)
Risk: 2% transmission | Action: Limited testing, observe if asymptomatic

HSV: Clinical Presentations by Type

SEM (45%)

Onset: 1-2 weeks
Vesicles on skin, eyes, mouth
Treat: 14 days IV

CNS (30%)

Onset: 2-3 weeks
Seizures, lethargy, fever
Treat: 21 days IV

Disseminated (25%)

Onset: 1-2 weeks
Shock, DIC, hepatitis
Treat: 21 days IV

HSV: Step-by-Step Diagnostic Testing

Step 1: Surface Swabs at 12-24 hours (NOT immediately at birth)
Mouth, conjunctivae, nasopharynx, anus for HSV PCR/culture

Step 2: Blood HSV PCR (viremia in all types)
Send before starting acyclovir if possible

Step 3: CSF analysis + HSV PCR (if ANY concern for CNS/disseminated)
High sensitivity and specificity; negative CSF PCR helpful

Step 4: CBC, ALT (assess for dissemination)

HSV Algorithm: Mother with Active Genital Lesions

Q1: Does mother have history of genital HSV in prior pregnancy?

YES → Likely recurrent infection
- Test: Surfaces + blood PCR at 12-24h
- If infant asymptomatic: Observe, educate parents
- If positive surfaces/blood OR symptoms: Full workup + treat

NO → Check maternal HSV-1/2 IgG (primary vs non-primary)
- Test: Surfaces + blood + CSF + ALT at 12-24h
- START empiric acyclovir 20 mg/kg IV Q8h immediately

HSV: Interpretation of Test Results

Scenario 1: Surface + Blood + CSF all negative, normal ALT
Decision: Pre-emptive therapy 10 days, then STOP. No suppression needed.

Scenario 2: Surface or blood positive, CSF negative, no symptoms
Decision: Likely SEM → Treat 14 days + 6-month suppression

Scenario 3: CSF positive OR disseminated disease
Decision: Treat 21 days. Repeat CSF PCR q7d until negative. Then 6-month suppression.

HSV: Precise Acyclovir Dosing

IV Acyclovir 20 mg/kg/dose every 8 hours

- Pre-emptive (no proven disease): 10 days
- SEM disease: 14 days
- CNS or Disseminated: 21 days (repeat CSF PCR before stopping)

Oral Suppression (after IV treatment)

Acyclovir 300 mg/m²/dose TID for 6 months

Monitor CBC every 2-4 weeks (watch for neutropenia)

HSV: Comprehensive Follow-Up Plan

During Suppression (6 months):
CBC with differential every 2-4 weeks (neutropenia common)

Ophthalmology:
Dilated fundoscopic exam (chorioretinitis, keratitis)

Neuroimaging:
MRI brain for CNS/disseminated disease (evaluate extent of injury)

Neurodevelopment:
Long-term developmental follow-up (50% recurrent skin lesions expected)

Congenital Syphilis

Risk Stratification • Complete Evaluation • Treatment Protocol

Syphilis: Why Every Infant Matters

2018: Highest rate since 1997 (33.1 per 100,000 live births)

- Universal maternal screening mandated at first prenatal visit
- **Critical rule:** No infant discharged without knowing mother's status
- Negative maternal RPR/VDRL does NOT eliminate diagnosis (rare early infection)
- Transmission risk increases with gestational age at maternal infection

Syphilis: Understanding Serology

Nontreponemal (VDRL, RPR) - Quantitative
Use: Monitor disease activity and treatment response
Goal: ↓ by 3 months, nonreactive by 6 months
False negative: Early primary, late latent syphilis

Treponemal (TP-PA, FTA-ABS, TP-EIA) - Confirmatory
Use: Confirm diagnosis (remain positive for life)
False positive: Other spirochetal diseases (Lyme, leptospirosis)

Syphilis: Three Risk Categories

1. Proven/Highly Probable
Abnormal exam OR infant titer ≥4-fold higher than maternal titer
Action: Full evaluation + IV penicillin × 10 days

2. Possible
Normal exam, maternal inadequate treatment or titer concerns
Action: Full evaluation + IV penicillin × 10 days OR IM benzathine × 1 (if all normal + f/u certain)

3. Unlikely
Normal exam, maternal adequate + old treatment, infant titer <4-fold maternal
Action: IM benzathine × 1 dose (preventive)

Syphilis: Complete Infant Evaluation

1. Thorough Physical Examination
Hepatosplenomegaly, rash (palms/soles), snuffles, pseudoparalysis

2. Laboratory Tests
CBC (anemia, thrombocytopenia), LFTs, quantitative RPR/VDRL

3. CSF Analysis (ALL with proven/possible disease)
VDRL (specific but insensitive), cell count, protein

4. Imaging + Special Tests
Long bone X-rays, neuroimaging if abnormal neuro, ABR, chest X-ray

Syphilis: Precise Penicillin Dosing

Aqueous Crystalline Penicillin G IV (Preferred)

Age ≤7 days: 50,000 units/kg/dose Q12h × 10 days
Age 8-30 days: 50,000 units/kg/dose Q8h × 10 days
Total daily: 100,000-150,000 units/kg/day

Procaine Penicillin G IM (Alternative)

50,000 units/kg/dose IM daily × 10 days

Benzathine Penicillin G IM (Single dose only)

50,000 units/kg × 1 dose (only if all tests normal + f/u certain)

Syphilis: Critical Treatment Rules

Rule 1: Never interrupt penicillin therapy
If >1 day missed → RESTART entire 10-day course from day 1

Rule 2: No alternatives to penicillin
Insufficient data on ampicillin, ceftriaxone for congenital syphilis

Rule 3: Benzathine only if ALL criteria met
Normal PE, normal labs, normal CSF, AND follow-up absolutely certain

Syphilis: Detailed Follow-Up Protocol

Month 1, 2, 3: Quantitative RPR/VDRL
Expect: Titer should ↓ by 3 months

Month 6: Quantitative RPR/VDRL
Expect: Nonreactive (if still reactive → re-evaluate)

Month 6-12: If titers stable or ↑
Action: CSF examination + re-treat with IV penicillin × 10 days

Long-term: Ophthalmology + Audiology
Monitor for late manifestations (interstitial keratitis, 8th nerve deafness)

Congenital Cytomegalovirus

Diagnosis • Treatment Criteria • Intensive Follow-Up

CMV: Critical Clinical Facts

- **Incidence:** 1 in 200 live births (most common congenital viral infection)
- **Paradox:** 75% from maternal reactivation (not primary infection)
- **#1 cause:** Non-genetic sensorineural hearing loss at birth (20%)
- **Delayed SNHL:** 40% develop hearing loss AFTER 1 month (why intensive f/u)

CMV: Defining Symptomatic Disease

Moderate-to-Severe Symptomatic (TREAT with valganciclovir):

- Thrombocytopenia (platelets <100,000)
- Petechiae or other CNS involvement
- Hepatosplenomegaly with elevated transaminases
- Hearing loss or microcephaly

Asymptomatic or Mildly Symptomatic (DO NOT treat):

Close follow-up only; treatment not proven beneficial

CMV: Diagnostic Testing Protocol

Gold Standard: CMV PCR from urine or saliva

MUST obtain within 3 weeks of birth (after = postnatal acquisition)

Saliva: Collect ≥1 hour after breastfeeding (avoid milk contamination)

Dried Blood Spot (DBS) PCR:

Positive = confirms, Negative = does NOT exclude (use urine/saliva)

Additional Tests if Positive:

CBC, platelets, LFTs, head imaging, hearing test, ophthalmology

CMV: Valganciclovir Treatment Protocol

Oral Valganciclovir 16 mg/kg/dose BID for 6 months

Indication: Moderate-to-severe symptomatic disease ONLY
Goal: Improved audiologic and neurodevelopmental outcomes at 2 years
Route: Oral solution (adjust dose monthly based on weight gain)

Alternative: IV Ganciclovir (severe/acute disease)

6 mg/kg/dose IV Q12h until stable, then switch to oral valganciclovir
Complete total 6 months of therapy

CMV: Treatment Monitoring

Weekly (first month):
CBC with ANC (neutropenia in 20% on valganciclovir, 67% on IV ganciclovir)

Every 2 weeks (after first month):
CBC with ANC (continue throughout 6-month treatment)

Monthly:
Serum ALT + weight (adjust valganciclovir dose based on growth)

Management of Neutropenia:
If ANC <500: Hold therapy, consider G-CSF, resume when recovers

CMV: Intensive Hearing Follow-Up Schedule

First 30 Months (Frequent Monitoring):
ABR or behavioral audiometry at 4, 6, 9, 12, 15, 18, 24, 30 months

Rationale: 40% develop SNHL after 1 month of age

School Age (Standard Plus Extra):
Standard at 4, 5, 6, 8, 10 years PLUS annual screens as needed

Other Monitoring:
Ophthalmology (chorioretinitis), neurodevelopmental assessment, head circumference

Perinatal HIV Prevention

Risk Assessment • Prophylaxis Regimens • Testing Schedule

HIV: Prevention Success Story

25-30%

Transmission WITHOUT intervention

<1%

Transmission WITH maternal ART + infant prophylaxis

100% of perinatal HIV infections become chronic/life-long

HIV: Infant Risk Categories

Low Risk (Standard Prophylaxis):
Mother on ART during pregnancy with sustained viral suppression
HIV RNA < lower limit of detection, good adherence
Action: Zidovudine (AZT) alone × 4-6 weeks

Higher Risk (Combination Prophylaxis):
No prenatal care, no ART, maternal viremia, adherence concerns
Action: 3-drug regimen (AZT + 3TC + NVP or RAL) × 2 weeks

HIV: Infant Prophylaxis Dosing

Zidovudine (AZT) - ALL Infants

4 mg/kg PO BID × 4-6 weeks (start within 12 hours of birth)

Alternative if unable to tolerate PO: 3 mg/kg IV BID

Lamivudine (3TC) - Higher Risk Only

2 mg/kg PO BID × 2 weeks

Nevirapine (NVP) or Raltegravir (RAL) - Higher Risk Only

NVP: 2 mg/kg/dose daily × 7 days, then 4 mg/kg/dose daily × 7 days

RAL: Weight-based dosing per guidelines × 2 weeks

HIV: Virologic Testing Schedule

Low Risk Infants (3 time points):

- 14-21 days of age
- 1-2 months of age
- 4-6 months of age

Higher Risk Infants (5 time points):

- Birth or 48 hours
- 14-21 days, 1-2 months, 2-3 months, 4-6 months

Test Type: HIV RNA PCR or DNA PCR (NOT antibody)

Maternal antibodies persist up to 18 months

Congenital Toxoplasmosis

Diagnosis • 1-Year Treatment • Long-Term Monitoring

Toxoplasmosis: Classic Triad

Hydrocephalus
Or microcephaly

Chorioretinitis
Can reactivate in teens/20s

Intracranial Calcifications
Scattered pattern

Also: Hepatosplenomegaly, jaundice, anemia, thrombocytopenia

Toxoplasmosis: Complete Workup

Serology (Most Important):

IgM and IgA antibodies (IgA more specific in newborns than IgM)
For age >1 year: IgG and IgM

Head Imaging:

CT or ultrasound for intracranial calcifications, hydrocephalus

Ophthalmology:

Dilated fundoscopic examination for chorioretinitis

Hearing Evaluation:

Baseline ABR or behavioral audiometry

Toxoplasmosis: 1-Year Treatment Regimen

Triple Therapy for 12 Months

Pyrimethamine: Loading 2 mg/kg/day × 2 days, then 1 mg/kg/day × 2-6 months, then 1 mg/kg every Monday-Wednesday-Friday

Sulfadiazine: 50 mg/kg PO BID × 12 months

Leucovorin (folinic acid): 10 mg three times weekly (prevents bone marrow suppression)

Key Point: Infection is suppressible but NOT curable

Toxoplasmosis: Treatment Monitoring

Weekly (first month):
CBC with differential (watch for neutropenia, thrombocytopenia from pyrimethamine)

Every 2 weeks (after first month):
CBC throughout entire 12-month treatment course

Serial Ophthalmology Exams:
Monitor for new/progressive chorioretinitis lesions

Lifelong Follow-Up:
Annual eye exams (reactivation can occur in teens/20s even with treatment)

Perinatal Hepatitis B

Universal Birth Dose • Passive-Active Immunization • Post-Vaccination Testing

Hepatitis B: Transmission Risk

Mother HBsAg+ / HBeAg- (lower viral load):
5-20% transmission risk

Mother HBsAg+ / HBeAg+ (high viral load):
70-90% transmission risk

Critical Facts:
- 98% transmission during delivery (only 2% in utero)
- 90% of perinatally infected infants develop chronic HBV
- With HBIG + vaccine: 95% prevention rate

Hepatitis B: Birth Dose Decision Tree

Mother HBsAg POSITIVE:
HBIG 0.5 mL IM + HepB vaccine (at different sites) within 12 hours
All birth weights, all gestational ages

Mother HBsAg NEGATIVE:
HepB vaccine within 24 hours if ≥2000g birth weight
If <2000g: Vaccine at 1 month or discharge (whichever first)

Mother HBsAg UNKNOWN:
HepB vaccine within 12 hours + HBIG within 7 days if status remains unknown or confirmed positive

Hepatitis B: Critical Timing Rules

Rule 1: HBIG efficacy is time-dependent
Optimal: Within 12 hours of birth
Unlikely effective: After 7 days of life

Rule 2: Separate anatomic sites
Give HBIG in one thigh, vaccine in opposite thigh (avoid interference)

Rule 3: Universal screening
Test ALL pregnant women every pregnancy, even if previously vaccinated

Hepatitis B: Post-Vaccination Management

If Mother HBsAg+ or Unknown:
Test infant at 9-12 months (after completing 3-dose vaccine series)

Tests to Order:
HBsAg (check for chronic infection) + anti-HBs (check for immunity)

If HBsAg negative, anti-HBs ≥10 mIU/mL:
Success! Immune, no further vaccine needed

If HBsAg negative, anti-HBs <10 mIU/mL:
Give 1 more dose → retest 1-2 months. If still low → give another 3-dose series

Perinatal Hepatitis C

Universal Screening • New CDC Testing Protocol • DAA Treatment

Hepatitis C: Key Clinical Facts

- CDC 2023: Universal screening all pregnant women every pregnancy
- **Transmission:** 6-7% risk if mother HCV RNA positive
- 25% in utero, 75% during delivery
- 80% of perinatally infected infants → chronic hepatitis
- **NO prophylaxis available** (no vaccine, no immunoglobulin)

Hepatitis C: CDC 2023 Testing Algorithm

Preferred: Age 2-6 Months (NEW GUIDELINE)

HCV RNA PCR (NAT) - Single test sufficient if positive

Rationale: Earlier diagnosis, earlier linkage to care

Alternative: Age 7-17 Months

HCV RNA PCR (NAT) if not tested earlier

Age ≥18 Months (Traditional Approach)

Anti-HCV antibody with reflex to HCV RNA PCR if reactive

At 18mo, maternal antibodies cleared

Hepatitis C: Result Interpretation & Follow-Up

HCV RNA Undetectable:
No further HCV-specific follow-up needed
Routine well-child care only

HCV RNA Detectable (Chronic HCV):
Refer to pediatric hepatology or pediatric infectious diseases
Direct-acting antivirals (DAAs) approved for age ≥3 years

Important Notes:
- Most perinatally infected infants asymptomatic for years
- Breastfeeding NOT contraindicated (no transmission via milk)

Prevention: What's Available?

Vaccine Available:
Hepatitis B (universal birth dose for all infants)

Passive + Active Immunization:
Hepatitis B (HBIG + vaccine)

Antiretroviral Prophylaxis:
HIV (maternal ART + infant ARV regimen)

No Prophylaxis (Maternal Treatment Key):
CMV, Toxoplasmosis, Syphilis, Hepatitis C

Top 10 Clinical Pearls

- HSV: Start acyclovir empirically in 1st episode maternal infection
- Syphilis: Never discharge infant without knowing maternal status
- CMV: Only treat moderate-severe symptomatic disease (not asymptomatic)
- CMV: 40% develop hearing loss AFTER 1 month → intensive audiology f/u
- HIV: Start prophylaxis within 12 hours for maximum efficacy

Top 10 Clinical Pearls (Continued)

- Toxo: Treatment is 12 months (suppressible, not curable)
- Hep B: HBIG ineffective after 7 days of life
- Hep C: New CDC guideline - test at 2-6 months (earlier than before)
- All: Congenital infection diagnosis requires testing within 3 weeks of birth
- All: Long-term follow-up essential (hearing, vision, neurodevelopment)

Thank You!

Questions?

AAP Red Book 2024-2027 • IDSA Guidelines • CDC 2023