

Hot Topics in Pediatric Infectious Diseases

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*49th Annual Mel L Cohen, MD Pediatric Update
March 2026*

Learning Objectives

- Review recent research and guideline changes relevant to diagnosis and treatment of infectious diseases in pediatric practice
- Discuss changes to pediatric vaccine schedules and new vaccines

Audience Response

The mother of one of your patients (a delightful 6-year-old male) recently delivered her second child, a healthy, full-term male infant. At the infant's initial visit on day of life #4, he is well-appearing and has a normal physical examination. His mother tells you that she had a **positive hepatitis test** during pregnancy, and that her obstetrician said that both she and the baby needed more evaluation. On review of the medical record, you find that the mother had a **positive anti-hepatitis C (HCV) antibody test** at her first prenatal visit and a **positive HCV RNA** test following that. She had never been previously tested for HCV, has been clinically well and does not know how she acquired the infection. All of her other prenatal infectious testing was un concerning (including negative HIV testing).

Which of the following is the best set of actions for this family?

Audience Response

Which of the following is the best set of actions for this family?

- A. Anti-HCV antibody testing for both children; start direct-acting antivirals if positive; ensure hepatology follow-up for the mother.**
- B. Anti-HCV antibody testing for all family members to guide therapy; post-exposure prophylaxis for everyone who tests positive.**
- C. HCV RNA testing for the infant at 2-6 months of age; anti-HCV antibody testing for the older brother as soon as feasible; ensure hepatology follow-up for the mother.**
- D. Hepatitis C vaccine and HCIG for the infant now; HCV RNA testing for the older brother as soon as feasible; ensure hepatology follow-up for the mother.**



Which of the following is the best set of actions for this family?

Hepatitis C: Evolving Epidemiology, Changing Guidelines

- **Hepatitis C:** RNA virus infection that can lead to chronic liver failure, fibrosis, cirrhosis, hepatocellular carcinoma.
- **Increasing rates of HCV infection** in the U.S. since 2010
 - More than three-fold increase in reproductive-age adults
 - Large increase in HCV diagnosis during pregnancy
- HCV can be **transmitted perinatally**
 - Approximately 6-7% of perinatally exposed infants will develop chronic HCV infection.
 - Direct-acting antiviral medications can be used as young as 3 years of age
 - However, many perinatally exposed infants are not tested for HCV, limiting follow-up and treatment options
- HCV testing now **recommended in every pregnancy** (2020 guidelines).

Hepatitis C: Evolving Epidemiology, Changing Guidelines

- **Previous testing recommendation for perinatally exposed infants:** anti-HCV antibody testing at 18 months of age.
 - Many children did not receive recommended testing
 - Loss to follow up, lack of awareness of recommendations
- **New recommendations (MMWR 2023) – goal is to diagnose earlier, ensure referral to care/treatment for children with HCV.**

Summary of HCV Perinatal Exposure Guidelines

- 1. All infants/children perinatally exposed to HCV (i.e., mother with positive HCV RNA) should be tested for HCV.**
- 2. Perinatally exposed infants should have HCV RNA testing at 2-6 months of age.**
 - If positive, refer to HCV specialist
 - If negative, no further testing unless clinically indicated.
- 3. Perinatally exposed infants/children 7-17 months of age and not previously tested should have HCV RNA testing.**
- 4. Perinatally exposed children ≥18 months and not previously tested should have anti-HCV antibody testing with reflex to HCV RNA.**

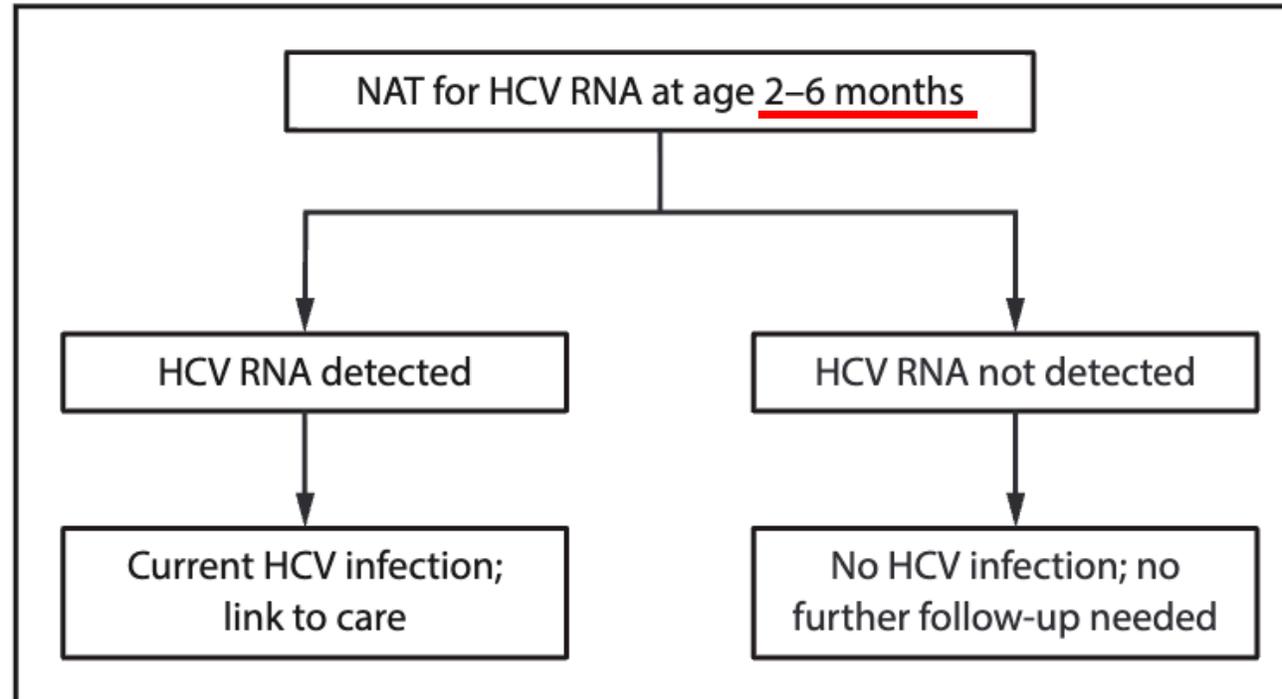
PMID 37906518

CDC Recommendations for Hepatitis C Testing Among Perinatally Exposed Infants and Children — United States, 2023

Lakshmi Panagiotakopoulos, MD¹; Amy L Sandul, DHS¹; Erin E. Conners, PhD¹; Monique A. Foster, MD²; Noele P. Nelson, MD¹; Carolyn Wester MD¹; Collaborators

FIGURE 3. Algorithm for hepatitis C virus testing of perinatally exposed children — United States, 2023^{*,†,§,¶}

**Age 2-17 months
Not previously tested**



Abbreviations: FDA = Food and Drug Administration; HCV = hepatitis C virus; NAT = nucleic acid test.

* Perinatally exposed children are children born to pregnant persons with HCV infection.

† Perinatally exposed children aged 7–17 months who have not previously been tested also should receive a NAT for HCV RNA.

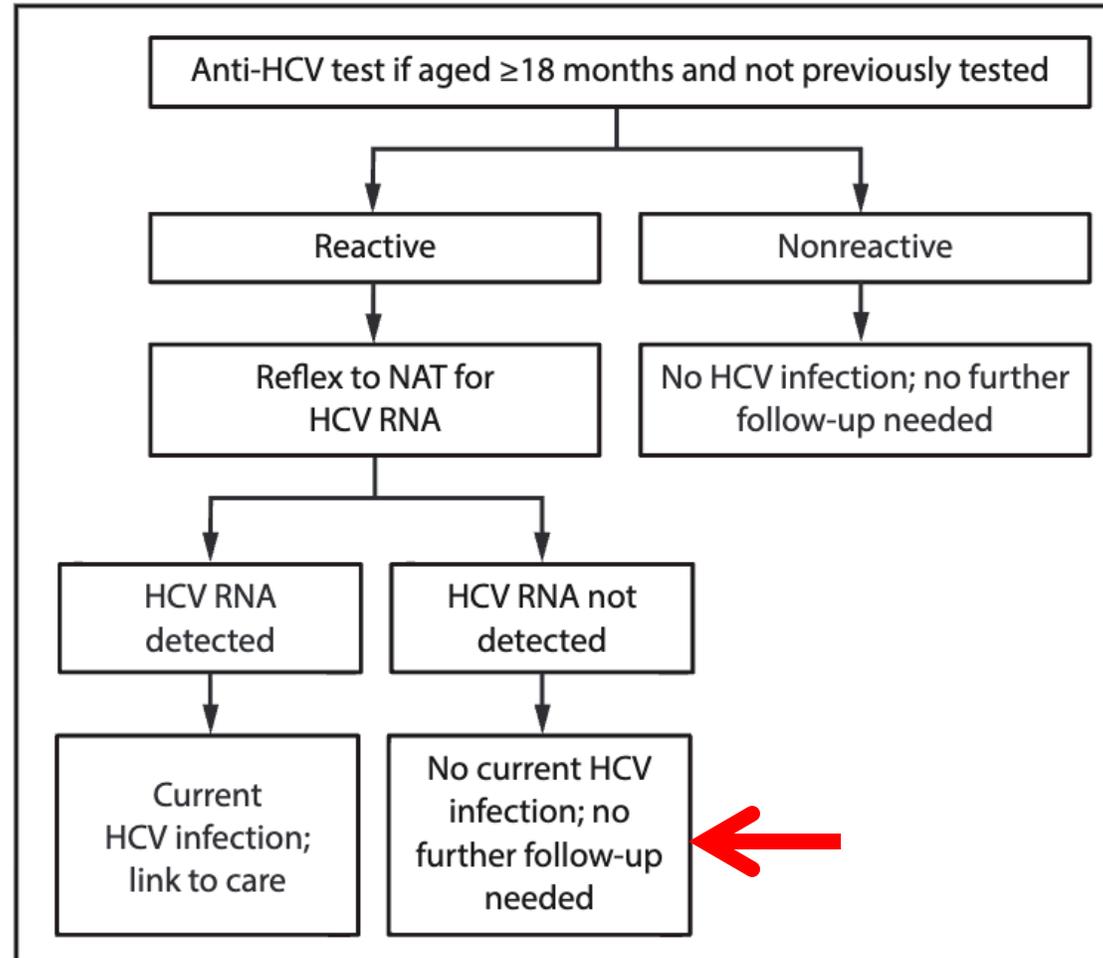
§ Off-label use of an FDA-approved diagnostic test requires validation by the testing laboratory.

¶ No further follow-up needed after a negative HCV RNA performed at age 2–6 months unless clinically warranted (i.e., clinical symptoms or signs or laboratory findings consistent with hepatitis C).

PMID 37906518

FIGURE 4. Algorithm for hepatitis C virus testing of perinatally exposed children* aged ≥ 18 months who have not previously been tested[†] — United States, 2023

**Age ≥ 18 months
Not previously tested**



Abbreviations: anti-HCV = hepatitis C virus antibody; HCV = hepatitis C virus; NAT = nucleic acid test.

* Perinatally exposed children are children born to pregnant persons with HCV infection.

[†] Not tested for perinatal HCV transmission with a NAT for HCV RNA at age [CDC Recommendations for Hepatitis C Testing Among Perinatally Exposed Infants and Children — United States, 2023](#)

PMID 37906518

Adopting the 2023 CDC Early Testing for Perinatal Hepatitis C: Call to Action for Pediatric Primary Care Providers

Ezzeldin Saleh and Marcela Rodriguez

Division of Pediatric Infectious Diseases, Southern Illinois University School of Medicine, Springfield, Illinois, USA

This paper has an excellent table with specific lab codes, CPT codes, blood volumes, etc. for HCV testing for infants/children.

Saleh E, Rodriguez M. Adopting the 2023 CDC Early Testing for Perinatal Hepatitis C: Call to Action for Pediatric Primary Care Providers. *J Pediatric Infect Dis Soc.* 2024 Nov 21;13(Supplement_5):S153-S158. doi: 10.1093/jpids/piae078. PMID: 39126181.

Audience Response

A two-week-old female infant comes to your office for her initial visit. The patient's mother moved to the area from out of state late in pregnancy to live with the patient's grandmother. The delivery took place at a local hospital, and the child has been well since then. According to the hospital records, the obstetrician on call at the time of delivery sent a full set of prenatal laboratory testing, as prior results were not available. Those tests were mostly reassuring. However, her **screening test for syphilis was positive**, and the **reflex RPR** was still pending at the time of discharge. That test resulted a few days later as positive with a **1:128 titer**. There are numerous notes in the chart about the hospital staff trying to contact the family but being unable to reach them. You ask the patient's mother about syphilis, but she is unaware of the positive test and has received no treatment recently or in the past.

In addition to contacting the local public health agency to help link the patient's mother with care, what are the next steps in evaluating the infant?

Don't you love syphilis questions?

In addition to contacting the local public health agency to help link the patient's mother with care, what are the next steps in evaluating the infant?

- A. Careful physical examination; reverse algorithm testing (syphilis EIA, followed by RPR if EIA is positive) for the infant; no further evaluation if patient is asymptomatic and exam normal, regardless of test results.**
- B. Careful physical examination; infant RPR, CBC/differential, CSF analysis, long bone films; possible additional testing; 10 days IV penicillin.**
- C. Careful physical examination; IM benzathine penicillin x 1 dose; RPR at 6 months of age.**
- D. Careful physical examination; nasopharyngeal PCR and darkfield microscopy to diagnosis congenital syphilis.**



In addition to contacting the local public health agency to help link the patient's mother with care, what are the next steps in evaluating the infant?

Syphilis

- Infection by *Treponema pallidum* (a spirochete)
- Distinct **clinical stages**
 - primary/secondary/tertiary
 - Asymptomatic latent period (early/late)
- Can cause **transplacental infection**
 - Higher rates (50-70%) in pregnancies complicated by primary infection
 - Lower (~15%) if infection \geq 1 year
 - Treatment decreases risk substantially



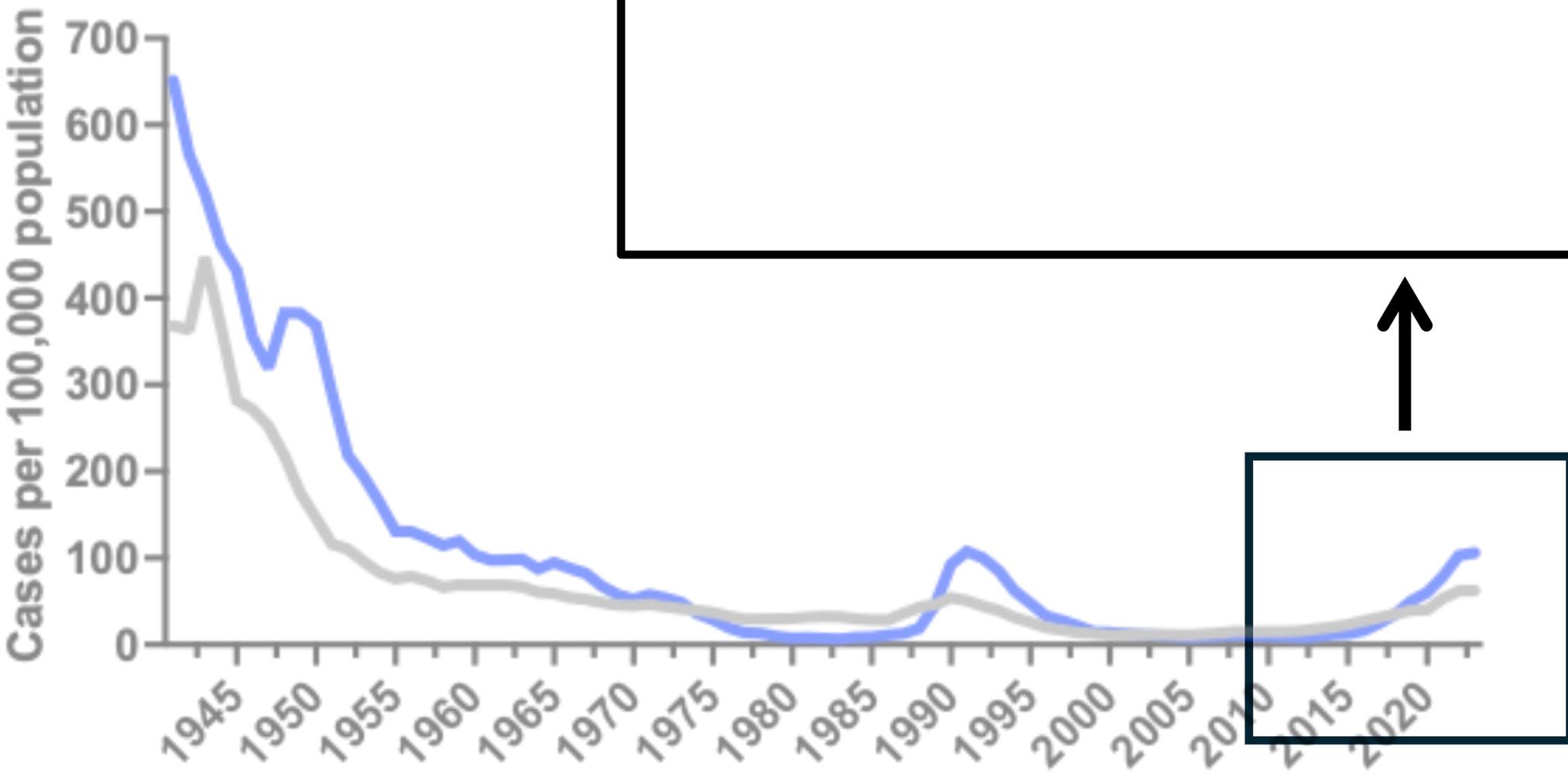
Clinical Manifestations of Congenital Syphilis (CS)

- Can cause stillbirth, hydrops fetalis, prematurity
- May be asymptomatic at birth
- Wide range of **early clinical signs** (at birth or in first 2 months)
 - Adenopathy, hepatosplenomegaly
 - Nasal secretions (“snuffles”), pneumonia
 - Mucocutaneous lesions, edema
 - Bony lesions (osteochondritis, periostitis), pseudoparalysis
 - Maculopapular rash (small dark red/copper spots especially on hands and feet)
 - Hemolytic anemia, thrombocytopenia
 - CNS involvement (hydrocephalus, meningitis, deafness)
- Untreated infants can develop **late signs**
 - CNS, bone/joints, teeth, eyes, and skin

Syphilis Epidemiology: Recent Cause for Concern

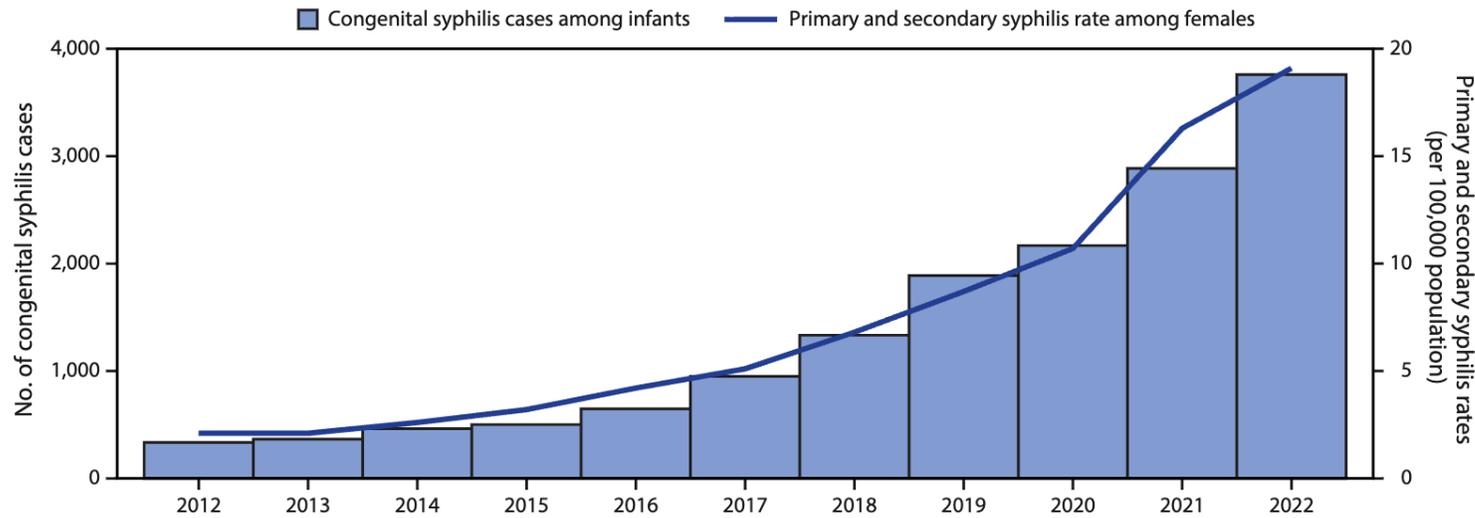
(per 100,000 population)

(per 100,000 live births)



Missed Opportunities for CS Prevention

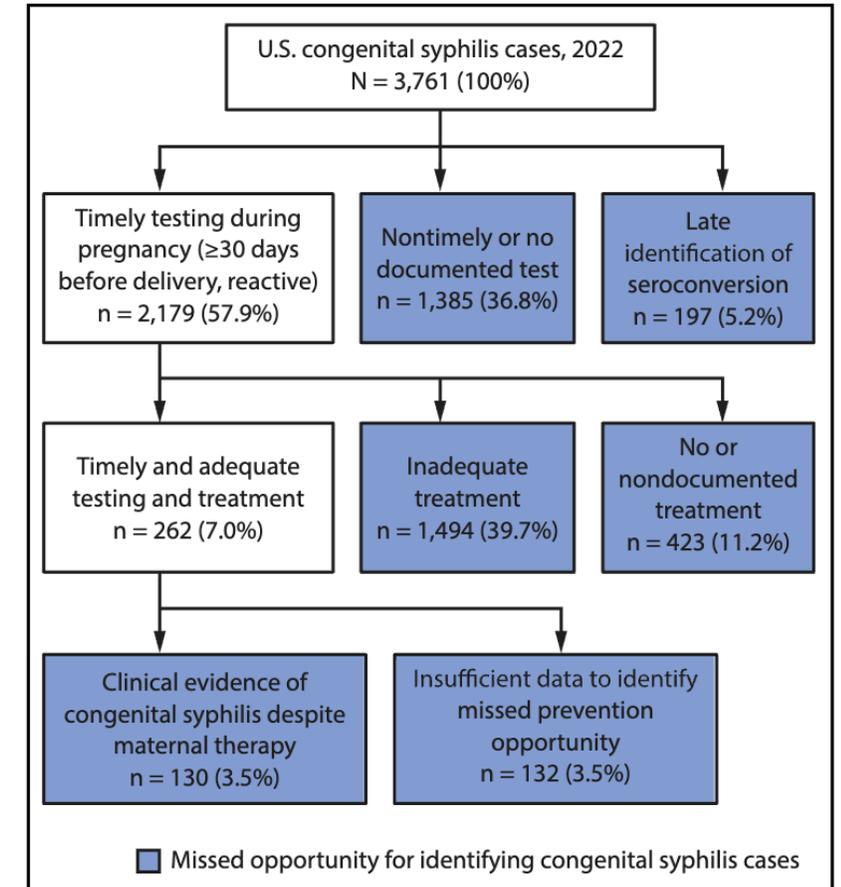
FIGURE 1. Reported number of cases of congenital syphilis among infants, by year of birth, and rates* of reported cases of primary and secondary syphilis† among females aged 15–44 years, by year — United States, 2012–2022



* Cases per 100,000 population.

† Primary and secondary syphilis case data for all U.S. territories and freely associated states and outlying areas were not available for all years; therefore, rates presented include only the 50 states and the District of Columbia.

FIGURE 2. Distribution of congenital syphilis cases, by missed prevention opportunities*,†,§ — United States, 2022



* Timely testing is performed ≥ 30 days before delivery.

† Late identification of seroconversion is a new reactive syphilis test < 30 days before delivery after a nonreactive test earlier in pregnancy.

§ Adequate treatment is receipt of a penicillin-based regimen, dosed and spaced appropriately for the stage of syphilis, and commenced ≥ 30 days before delivery.

CS in 2022

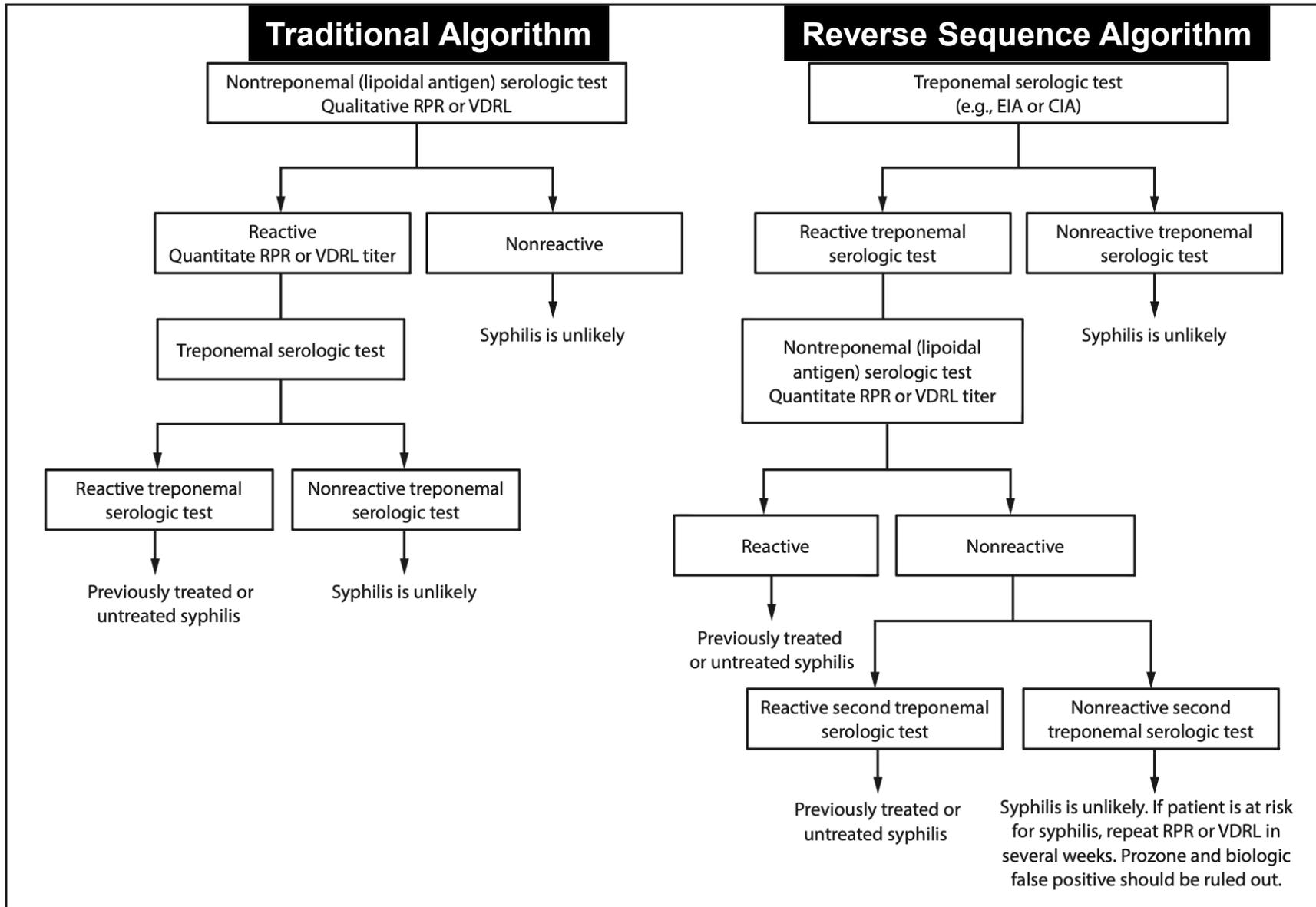
- 3,761 reported cases in US
- 231 (6%) stillbirths
- 51 (1%) infant deaths.

PMID 37971936

Maternal Screening for Syphilis

- **Screening in every pregnancy**
 - First prenatal visit (mandated in many states)
 - 28 weeks (recommended)
 - At delivery (recommended in high prevalence areas or if increased risk for acquisition)
- **Universal screening** is crucial! Nearly half of newly diagnosed cases lack any clear risk factors.
- **Treatment during pregnancy** for those testing positive and without a confirmed history of prior adequate treatment.
 - Penicillin-based regimens
 - As appropriate for stage of syphilis
- **Sonographic evaluation** for signs of congenital syphilis if maternal diagnosis in second half of pregnancy
- **Repeat RPR titers** to assess response to therapy

Maternal Screening for Syphilis



Abbreviations: CIA = chemiluminescence immunoassay; EIA = enzyme immunoassay; RPR = rapid plasma regain; TPPA = *Treponoma pallidum* particle agglutination; VDRL = Venereal Disease Research Laboratory.

Neonatal (Up to 1 Month) Evaluation for CS

- “No newborn infant should be discharged from the hospital without confirmation of the birthing parent’s serologic status for syphilis.”
- Careful physical exam
- Quantitative non-treponemal test (RPR)
- Additional testing depending on maternal history (e.g., adequate treatment), RPR results, clinical signs

**Look at the AAP Red Book algorithm!
Fig. 3-18 in the 2024-2027 Red Book**

**Or the interactive algorithm:
<https://www.aap.org/en/patient-care/congenital-syphilis/congenital-syphilis-evaluation-and-treatment-guide/>**

Proven or Highly Probable Congenital Syphilis

Findings	Evaluation	Treatment
Abnormal PE OR Serum RPR 4-fold or greater than maternal RPR titer OR Positive darkfield or PCR test of placenta, cord, lesions, fluids (or positive silver stain of placenta or cord)	<ul style="list-style-type: none">• CBC/differential• CSF (cell count, protein, VDRL)• Long bone radiographs• Other tests as clinically indicated (e.g., CXR, LFT, neuroimaging, ophthalmologic examination, and auditory brain stem response)	Aqueous crystalline penicillin G intravenous x 10 days (preferred) OR Penicillin G procaine 50,000 IM x 10 days

Possible Congenital Syphilis

Findings	Evaluation	Treatment
<p>Normal PE</p> <p>AND</p> <p>Serum RPR equal to or less than 4-fold the maternal RPR titer</p> <p>AND</p> <p><u>Any of the following:</u></p> <ul style="list-style-type: none"> • Mother was not treated, inadequately treated, or no documentation of treatment. • Mother treated with a non-penicillin G regimen. • Maternal treatment initiated <30 days before delivery. 	<ul style="list-style-type: none"> • CBC/differential • CSF (cell count, protein, VDRL) • Long bone radiographs • Other tests as clinically indicated (e.g., CXR, LFT, neuroimaging, ophthalmologic examination, and auditory brain stem response) 	<p>Aqueous crystalline penicillin G intravenous x 10 days (preferred)</p> <p>OR</p> <p>Penicillin G procaine 50,000 IM x 10 days</p> <p>OR</p> <p>Penicillin G benzathine 50,000 IM x 1 dose (only if all components of evaluation normal and follow-up certain)</p>

Congenital Syphilis Less Likely

Findings	Evaluation	Treatment
<p>Normal PE</p> <p>AND</p> <p>Serum RPR equal to or less than 4-fold the maternal RPR titer</p> <p>AND</p> <p><u>Both of the following:</u></p> <ul style="list-style-type: none">• Mother was treated adequately during pregnancy and treatment initiated \geq 30 days before delivery.• Mother has no evidence of relapse.	<p>No evaluation.</p>	<p>Penicillin G benzathine 50,000 IM x 1 dose (preferred)</p> <p>Red Book lists additional criteria that may allow following titers every 2-3 months without treatment (not preferred).</p> <p>Nontreponemal antibody titers should decrease by 3 mo of age and should be nonreactive by 6 mo of age; patients with increasing titers or with persistent stable titers 6 to 12 mo after initial treatment should be reevaluated, including CSF examination, and treated with a 10-day course of parenteral penicillin G, even if they were treated previously</p>

Congenital Syphilis Unlikely

Findings	Evaluation	Treatment
<p>Normal PE</p> <p>AND</p> <p>Serum RPR equal to or less than 4-fold the maternal RPR titer</p> <p>AND</p> <p><u>Both of the following:</u></p> <ul style="list-style-type: none">• Mother was treated adequately before pregnancy.• The mother's nontreponemal serologic titer remained low and stable (i.e., serofast) before and during pregnancy and at delivery (e.g., VDRL \leq1:2 or RPR \leq1:4)..	<p>No evaluation.</p>	<p>None, but infants with reactive nontreponemal tests should be followed serologically to ensure test result returns to negative.</p> <p>Can consider Penicillin G benzathine 50,000 IM x 1 dose if infant RPR is positive and follow-up is uncertain.</p> <p>Neonates with a negative nontreponemal test result at birth and whose birthing parent was seroreactive at delivery should be retested at 3 mo to rule out incubating congenital syphilis.</p>

Infants ≥ 1 Month: Evaluation for CS

- **Clinical suspicion** is key – if the infant or child identified has reactive serologic tests for syphilis, the birthing parent's serologic test results and records should be reviewed to assess whether the infant or child has congenital or acquired syphilis.
- CSF analysis for VDRL, cell count, and protein
- CBC/differential
- Consider long bone films, CXR, LFT, ophthalmologic exam, neuroimaging, audiology – depending on clinical signs.
- HIV testing

Considerations for Longitudinal Management of Children with CS

- **Serologic monitoring** for children who had positive RPR testing
- **Neurologic monitoring** – some children may need repeat LP if initial CSF analysis was abnormal or persistent positive RPR or if neurological signs develop.
- **Periodic hearing/vision screening** for late manifestations of CS
- **Developmental/growth** screening for late manifestations of CS

Audience Response

An unvaccinated but otherwise well young adult presents to your office with a 5-day history of low-grade fever, neck stiffness, back and abdominal pain, constipation, and two days of bilateral lower extremity weakness. On his evaluation, you are concerned about possible meningitis and also concerned for acute flaccid myelitis. You refer him to a local emergency department, and he is hospitalized for further evaluation and treatment. Testing of the patient's stool reveals **type 2 poliovirus.**

Which of the following best represents your emotions at this time?

Audience Response

Which of the following best represents your emotions at this time?

A. What?!? What is going on? I thought polio was gone.

B. Flaming, seething anger

C. OMG, is this the beginning of a polio outbreak?

D. When can I retire?

This is a real case from 2022!

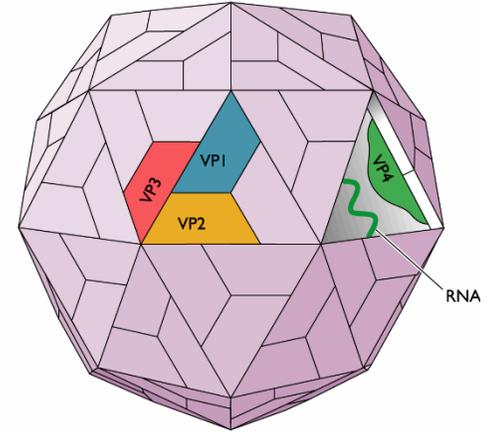
Link-Gelles R et al. Public Health Response to a Case of Paralytic Poliomyelitis in an Unvaccinated Person and Detection of Poliovirus in Wastewater - New York, June-August 2022. *MMWR Morb Mortal Wkly Rep.* 2022;71(33):1065-1068. doi: 10.15585/mmwr.mm7133e2. PMID: 35980868; PMCID: PMC9400530.



**Testing of the patient's stool reveals type 2 poliovirus.
Which of the following best represents your emotions at this
time?**

Poliovirus

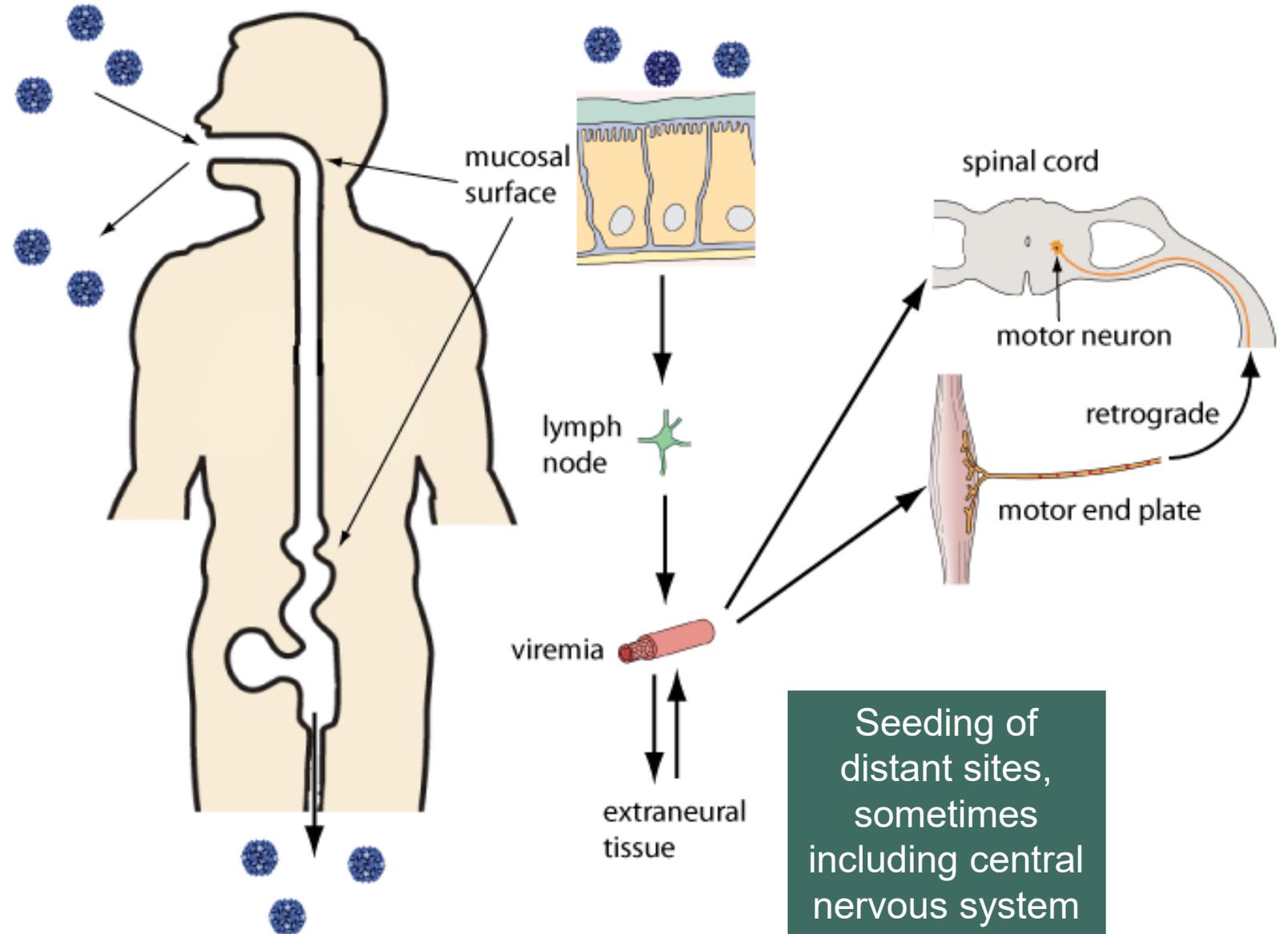
- *Picornavirus* family (pico=small; rna=RNA; virus=virus)
- Member of enterovirus group
- Non-enveloped (environmentally stable), spherical virus
- Three serotypes



Poliovirus Life Cycle

- Poliovirus spreads through the fecal-oral route, infects epithelial cells, accesses the blood (viremia), and seeds other tissues.

- Poliovirus can replicate in and kill neurons, leading to paralysis.



Polio: Clinical Features

- Very contagious
- Incubation period = 6-20 days
- Diagnosis: viral isolation or PCR from throat (early) or stool (3-6 weeks)
- Ranges from **clinically inapparent illness (~90% of infections)** to paralysis

- **Abortive poliomyelitis** (4-8% of cases)
 - Mild viral syndrome
 - Fever, headache, sore throat
 - No neurological sequelae

- **Nonparalytic poliomyelitis** (1-2% of cases)
 - As above but with signs of meningeal infection
 - Severe headache, neck stiffness (aseptic meningitis)
 - Full recovery after 2-10 days

Polio: Clinical Features

Spinal paralytic poliomyelitis (<1% of cases)

- biphasic illness
 - first phase mimics abortive polio
 - followed 2-5 days later by headache, fever, vomiting, myalgia
- **weakness and flaccid paralysis**
- **asymmetric paralysis**: generally lower limbs, proximal muscles
- can involve respiratory muscles
- recover from paralysis (often incomplete) can occur
- ~10% fatality rate

• Bulbar paralytic poliomyelitis (<0.1% of cases)

- Cranial nerve paralysis (mostly CN 9, 10, 12)
- Vasomotor and respiratory centers involved
- Respiratory muscle paralysis
- ~50% fatality rate

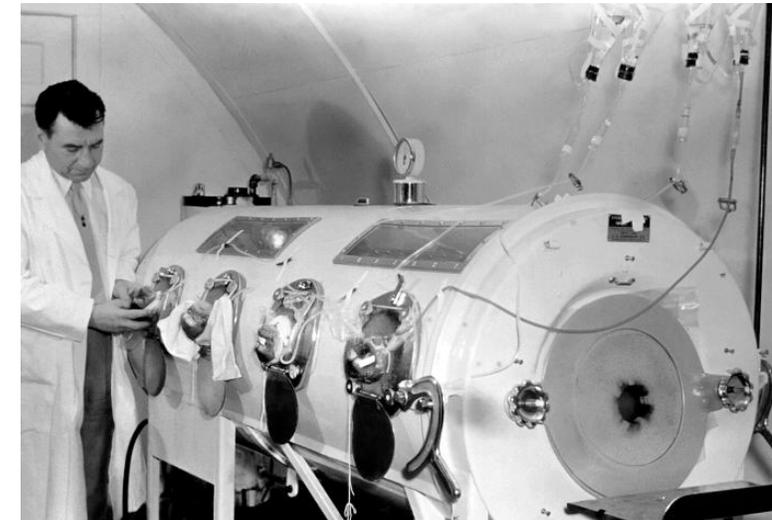
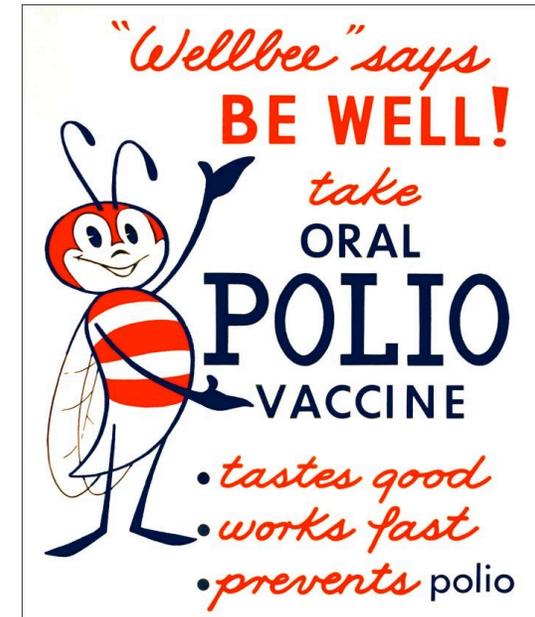


Image: CDC PHIL 11262

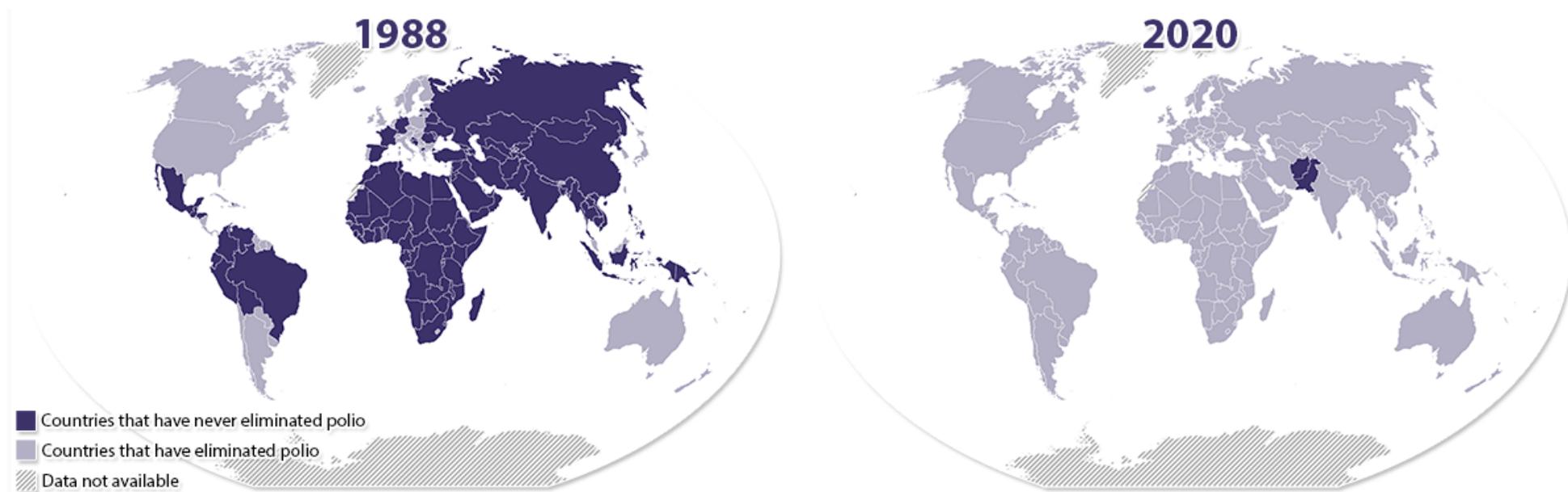
Polio: Two Vaccine Strategies

- Once a **worldwide disease**, yearly **peaks in summer months**
- Polio vaccines
 - **Inactivated polio vaccine (IPV; Salk)** introduced 1955
Chemically inactivated; 3 serotypes; injected
Induces **systemic immunity**; limited/no mucosal immunity
 - **Oral polio vaccine (OPV; Sabin)** introduced 1961
Live-attenuated; 3 serotypes; oral drops
Induces **systemic and mucosal immunity**
Can spread to others ("secondary vaccination")
- Potential downsides to OPV use
 - **Vaccine-associated paralytic polio (VAPP)**
 - Rare (1 case / 2.4 million doses) – mostly with first dose
 - Does not cause outbreaks (only in vaccinee or very close contacts)
 - **Circulating vaccine-derived polioviruses (cVDPV)**
 - Prolonged circulation of OPV strain in undervaccinated populations
 - Mutations that restore virulence, facilitate transmission
 - Can cause outbreaks, paralytic cases



Polio Control

- Crucial role of OPV in global polio control
- Transmission of wild-type polio interrupted in U.S. in 1979
- Last case in Western hemisphere 1991
- Since 2000, U.S. has used **only IPV**.



Polio elimination status as of 1988 is based on multiple sources, because the quality and methods of data collection varied widely at that time. Current boundaries are shown on both maps. Boundaries shown do not imply the expression of any opinion concerning the legal status of any country or territory.

Take-Home Points

- **Perinatal transmission of hepatitis C virus** is an important threat to children's health.
 - Universal screening in pregnancy
 - New recommendations for testing and treatment of perinatally exposed infants
 - Early diagnosis and referral to care can be life-saving.
- **Congenital syphilis** is increasingly common and can be challenging to diagnose.
 - Standardized approaches to screening and treatment
 - Importance of longitudinal follow-up
- Despite widespread vaccination, **polio** remains a threat globally.
 - Ongoing spread of wild-type polio in at least 2 countries
 - VDPV2 cases still occur, including in the US in 2022.
 - Anti-vaccination voices are now targeting polio vaccine.

Thank you!