Deja vu all over again

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Factors in the Emergence or Re-emergence of Infectious Diseases

- Introduction into a vulnerable population
- Ability to spread readily from person-to-person and cause disease
- Also must be able to sustain itself within the population, that is more and more people continue to become infected

Disclaimer

- Employed by Quest Diagnostics
Many emerging diseases arise when infectious agents in animals are passed to humans (zoonoses). Expanding human population, Numbers, New geographic areas, Close contact with animal species, Increased human density and mobility.

Antimicrobial resistance, Poor immunization rates, Bacteria, viruses and other microorganisms can change over time (mutate, develop resistance), Deliberate introduction (bioterrorism), Climate change, Habitats altered, Diseases can spread into new geographic areas, i.e. warming temperatures allow mosquitos to expand their range and the diseases they carry.

Measles, Syphilis, Pertussis, Chlamydia, Gonorrhea, Plague, Mumps.

Sarah E. Kidd, MD, Nestor A. Gray, MD, PhD, Elizabeth A. Torres, BS, MPH, Hildreth S. Weinraub, MD

During 2013–2017, the national annual rate of reported primary and secondary (P/S) syphilis cases in the United States increased 27.7%, from 3.5 to 4.5 cases per 100,000 population (1). The highest rates of P/S syphilis are seen among gay, bisexual, and other men who have sex with men (collectively referred to as MSM) (2), and MSM accounted for 99.7% of reported P/S syphilis cases among men (2). However, during 2015–2017, the P/S syphilis rate among women increased 155.6% (from 0.9 to 2.3 cases per 100,000 women), and the rate among all men increased 45.7% (from 10.2 to 14.9 cases per 100,000 men), indicating increasing transmission between men and women in addition to increasing transmission between men who have sex with men.

Primary and Secondary Syphilis — Distribution of Cases by Sex and Sexual Behavior, 2017

- Men who have sex with men only (n = 13,953)
- Men who have sex with men and women (n = 7,783)
- Men who have sex with women only (n = 4,340)
- Men without data on sex of sex partners (n = 4,001)
- Women (n = 3,222)
- Cases with unknown sex (n = 37)

Primary and Secondary Syphilis — Rates of Reported Cases by State, United States and Outlying Areas, 2017

[Map showing rates per 100,000 population by state.]
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Congenital Syphilis — Reported Cases by Year of Birth and Rates of Reported Cases of Primary and Secondary Syphilis Among Women Aged 15–44 Years, United States, 2008–2017

Primary and Secondary Syphilis — Rates of Reported Cases by Region, United States, 2008–2017
Syphilis

- **Primary**
  - Painless ulcer (chancre) at site of inoculation, heals within 3-6 weeks

- **Secondary**
  - Systemic stage of the infection, protean symptoms
  - Rash is macular, papular, annular, pustular, etc
  - Can involve any organ
  - Stage where serologic tests reactive but no clinical manifestations
  - Disease is still systemically active

- **Tertiary**
  - Slow progressive, destructive inflammatory process 5 to >30 after initial infection
  - Generally subdivided: neurosyphilis, cardiovascular, gummatous

### Table: Application and Limitations of Diagnostic Tests in Different Stages of Syphilis

<table>
<thead>
<tr>
<th>Stage</th>
<th>Recommended Tests</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary syphilis</td>
<td>Direct immunofluorescence, non-treponemal tests</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Treponemal tests</td>
<td>Implicated test to detect early syphilis.</td>
</tr>
<tr>
<td>Secondary syphilis</td>
<td>Direct immunofluorescence, non-treponemal tests, Treponemal tests</td>
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</tr>
<tr>
<td>Latent syphilis</td>
<td>Non-treponemal tests, Treponemal tests</td>
<td></td>
</tr>
<tr>
<td>Tertiary syphilis</td>
<td>Non-treponemal tests, Treponemal tests</td>
<td></td>
</tr>
<tr>
<td>Congenital syphilis</td>
<td>Direct immunofluorescence, non-treponemal tests</td>
<td></td>
</tr>
</tbody>
</table>
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Secondary Syphilis: Palmar/Plantar Rash

Source: Seattle STD HIV Prevention Training Center at the University of Washington, UW Health Image Bank
Source: CDC/CHST/Division of STB Prevention, STB Clinical Stills
Congenital Syphilis

- can be passed from mother to fetus at any stage of syphilis
- placenta protects baby up to 6 mo.
- then, bacteria enters fetal bloodstream:
  - 30% miscarriage
  - 70% born with congenital syphilis and go through normal progression of disease
- can severely damage developing tissues of newborn causing:
  - fulminant hepatitis
  - pulmonary haemorrhage
  - intercurrent bacterial infections, many die
- Early congenital syphilis signs develop over the first 2–10 weeks of life:
  - vesicular or bullous rash involving the sole and palms
  - mumps (snuffles)
  - widespread visceral involvement
- Late congenital syphilis: develop throughout childhood,
  - interstitial keratitis
  - meningitis
  - Clutton’s joints
  - Hutchinson’s teeth
  - and skeletal changes.
Early Congenital Syphilis

- Hepatosplenomegaly
- Diffuse inflammation
- Jaundice
- Generalized lymphadenopathy
- Epitrochlear nodes
- Coombs - hemolytic anemia
- Hydrops fetalis
- Mucocutaneous: rhinitis (Highly infectious, "snuffles")
- Maculopapular rash
- Desquamation
- Pemphigus syphiliticus
- Vesicular bullous eruptions of palms/soles
- Petechial lesions
- Bony lesions
- Syphilitic leptomenigitis
- Chorioretinitis
- Pancreatitis

#POMA19 #ChooseKnowledge
Follow Up

- Patients treated for primary or secondary syphilis should be reexamined clinically and serologically 6 months and 12 months following treatment.
- Patients with latent syphilis should be followed up clinically and serologically at 6, 12, and 24 months.
- Persons with HIV infection should be evaluated more frequently; for primary or secondary syphilis at 3, 6, 9, 12, and 24 months and for latent syphilis at 6, 12, 18, and 24 months.
- If CSF pleocytosis was present initially, a CSF examination should be repeated every 6 months until the CSF cell count is normal. If the cell count has not decreased after 6 months, or if the CSF cell count or protein is not normal after 2 years, retreatment should be considered.
- Follow-up titers should be compared to the maximum or baseline nontreponemal titer obtained prior to treatment.

Summary

- Syphilis is a systemic infection caused by Treponema pallidum, and in the absence of treatment, patients remain chronically infected and progress through stages of disease, characterized by episodes of active clinical manifestations interrupted by periods of asymptomatic latent infection.
- Of primary and secondary syphilis cases diagnosed in men who have sex with men, approximately one-half of the men are coinfected with HIV.
- Neurosyphilis and ocular syphilis can occur at any stage of infection.
- Untreated syphilis in pregnancy can lead to devastating consequences, including stillbirth, neonatal death, and congenital syphilis.
- The laboratory diagnosis of syphilis is challenging and requires using a combination of clinical criteria and laboratory tests (both treponemal and nontreponemal tests) to differentiate active infection, prior infection, and absence of infection.
- Screening for syphilis is recommended in all pregnant women, men who have sex with men, persons with HIV infection, and other groups at high risk for acquisition of syphilis.
- Penicillin G, administered parenterally, is the preferred drug for treatment of all stages of syphilis and is effective in resolving clinical symptoms associated with primary and secondary syphilis as well as preventing late sequelae.
- The Jarisch-Herxheimer reaction is a self-limited reaction associated with initiation of anti-treponemal therapy and is characterized by fever, malaise, nausea, vomiting, and less frequently, chills and exacerbation of a secondary syphilis rash.
- Persons who have had sexual contact within 90 days preceding the diagnosis of primary, secondary, or early latent syphilis should receive presumptive treatment for early syphilis (congenital syphilis can extend beyond 90 days with appropriate treatment). If serologic testing of the sexual contact is not immediately available, presumptive treatment should be started in all if the sexual contact occurred more than 90 days prior.
Figure 2. Chlamydia — Rates of Reported Cases by Region, United States, 2008–2017

Chlamydia — Rates of Reported Cases by State, United States and Outlying Areas, 2017

Reported Cases of Chlamydia (per 100,000 population)
Chlamydia — Rates of Reported Cases by Age Group and Sex, United States, 2017

Men
Rate (per 100,000 population)

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Women

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Chlamydia

Most common nonviral STD, most common reportable bacterial STD in the US

Most significant contributor to cost with lifetime direct medical costs estimated at 516.7 million

Highly transmissible, per-act transmission risk of about 10%

> men-to-women than from women-to-men

Risk factors

New or multiple sex partners

History of STIs

Presence of another STI

Lack of barrier contraception

Chlamydia Clinical Manifestations

Men

Urethritis, mostly asymptomatic

Epididymitis

Women

Cervicitis

Urethritis

PID

Perihepatitis (Fitz-Hugh-Curtis Syndrome)
Nucleic Acid Amplification Tests (NAATS)
- Non-amplification molecular tests
- Culture
- Serology

Women who have sex with men
Women who have sex with women
Pregnancy
Men who have sex only with women
Men who have sex with men
Transgender men and women
Persons with HIV infection
Correctional facilities

Chlamydia Diagnosis

Screening for Chlamydia

Treatment
For patients diagnosed with urogenital chlamydial infection, all sex partners with whom they had sexual contact in the preceding 60 days should be referred for evaluation, testing and presumptive treatment.

The most recent partner should be evaluated and treated even if the time of the last contact was >60 days before the patient’s onset of symptoms.

Chlamydia is the most common reportable STI in the US with approx 1.7 million cases in 2017. Peak incidence in the US is in females aged 15-24 years. Can cause a wide range of clinical manifestations. Screening for chlamydia in asymptomatic persons reduces the incidence of chlamydia-associated complications. In most cases, the preferred diagnostic method is NAAT. Treatment is single dose azithromycin. Persons who are diagnosed should receive counseling.

**Trichomonas vaginalis and Other Vaginal Infections Among Females — Initial Visits to Physicians’ Offices, United States, 1966–2016**

![Graph showing visits for Trichomonas vaginalis and other vaginal infections from 1966 to 2016]
Why Has the Number of Reported Pertussis Cases Increased?
- Incomplete immunization of children
- Vaccine immunity is variable and wanes over time
- Persistent human reservoir
- Better awareness of disease as a result of improved diagnostic testing
- Underdiagnosis and misdiagnosis result in ongoing transmission
- Inadequate use of chemoprophylaxis in close contacts

References:
1. CDC. MMWR. 2002;51(4):73-76.

Reported Pertussis Cases Are the Tip of the Iceberg
- Nationwide, a small percentage of pertussis cases are actually reported
- Underreporting may be greatest among adults and adolescents

When Is Pertussis Communicable?
- Persons with pertussis become highly infectious during the catarhal stage.
- Some individuals, especially infants, may be infectious for a longer period than shown above.

References:
Transmission of Pertussis

- Pertussis is transmitted to and from all age groups.
- Highly contagious, with 80% secondary attack rate among susceptible household contacts. Transmission of pertussis to household members has been documented.
- Young infants get pertussis primarily from family members, and are at high risk of morbidity and mortality.
- Adolescents get pertussis from household contacts and schoolmates.
- Adults get pertussis from work and household contacts; parents (adult and adolescent) give pertussis to their infants.

Reported Source of Pertussis Infection Among Infants < 12 Months of Age

<table>
<thead>
<tr>
<th>RELATION OF SOURCE TO INFANT</th>
<th>NUMBER OF INFANTS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>54 (14)</td>
</tr>
<tr>
<td>Father</td>
<td>19 (5)</td>
</tr>
<tr>
<td>Grandparent</td>
<td>22 (6)</td>
</tr>
<tr>
<td>Sibling</td>
<td>52 (15)</td>
</tr>
<tr>
<td>Other</td>
<td>47 (11)</td>
</tr>
<tr>
<td>Unknown</td>
<td>132 (37)</td>
</tr>
</tbody>
</table>


Severe vs Mild Pertussis

<table>
<thead>
<tr>
<th>Severe</th>
<th>Mild or Atypical</th>
</tr>
</thead>
<tbody>
<tr>
<td>• More common in infants¹</td>
<td>• Characteristic symptoms (eg, whoop) often absent¹</td>
</tr>
<tr>
<td>• Mostly occurs in nonimmune individuals¹</td>
<td>• Persons with atypical disease are important sources of transmission to infants¹</td>
</tr>
<tr>
<td>• Paenymetal cough (≥14 days’ duration) with at least one of the following: loud inspiration (whoop), or post-tussive vomiting and gagging without other apparent cause</td>
<td>• Pertussis represents 12% to 52% of prolonged cough illness seen in adults¹</td>
</tr>
<tr>
<td>• Some infants may have atypical diseases¹</td>
<td>• Often goes unrecognized, underdiagnosed¹</td>
</tr>
</tbody>
</table>

References:

References:
About half of babies younger than 1 year old who get pertussis need care in the hospital.

- 1 out of 4 (25%) get pneumonia (lung infection)
- 1 out of 100 (1.1%) will have convulsions (violent, uncontrolled shaking)
- 3 out of 5 (61%) will have apnea (slowed or stopped breathing)
- 1 out of 300 (0.3%) will have encephalopathy (disease of the brain)
- 1 out of 100 (1%) will die

About half of babies younger than 1 year old who get pertussis need care in the hospital.

http://www.pkids.org/diseases/pertussis.html
Diagnostic Tests for Pertussis

- Nasopharyngeal (NP) culture on special media (Regan-Lowe, Bordet-Gengou)
- Polymerase chain reaction (PCR)
- Serologic tests
- Increased white blood cell (WBC) count with absolute lymphocytosis
- Direct fluorescent antibody (DFA)—variable sensitivity/specificity

Pertussis Summary

- Reports of pertussis, which have increased dramatically in recent years, represent only fraction of actual cases
- Largest increases in reported cases are among adolescents and adults
- Pertussis immunity, following disease or vaccination, wanes over time
- Disease in adolescents and adults associated with significant morbidity and complications, and with transmission to infants
- Infant pertussis is often severe, leading to hospitalization and mortality; deaths continue to increase among infants too young to be fully vaccinated
Measles outbreaks reported to CDC, 2019

- New York State, Rockland County
- New York City
- Washington
- Texas
- Illinois
- California

These outbreaks are linked to travelers who brought measles back from other countries such as Israel and Ukraine, where large measles outbreaks are occurring. Make sure you are vaccinated against measles before traveling internationally.
Spread of Measles

- Majority of people who got measles are unvaccinated
- Still common in many parts of the world (Europe, Asia, Pacific and Africa)
- Travelers with measles continue to bring the disease into the US
- Measles can spread when it reaches a community in the US where groups of people are unvaccinated

Measles and Transmission

- Febrile rash illness caused by measles virus
- Transmitted via respiratory droplets and aerosol
  - Spread by coughing and sneezing, close personal contact or direct contact with infected nasal or throat secretions
- Contagious from 4 days before to 4 days after rash onset
- Secondary attack rates in susceptible household contacts is about 90%
Measles

- Prodrome (2-4 days)
- Fever (up to 105°F)
- Cough, Coryza, and/or Conjunctivitis
- Enanthem (Koplik spots)
- Rash about 14 days after exposure (range 7-21)
  - Maculopapular
  - Spreads from head to trunk to extremities
  - May become confluent
  - Lasts 5-6 days and fades in order of appearance

The 3 C’s

- Cough
- Coryza
- Conjunctivitis

Why have there been more measles cases in the US in recent years?

- More measles cases than usual in some countries to which Americans often travel (England, France, Germany, India, the Philippines and Vietnam) and therefore more measles cases coming into the US, and/or
- More spreading of measles in US communities with pockets of unvaccinated people
How common was measles in the US before vaccine?
- Vaccine program started in 1963
- 3-4 million people got measles each year in US
- 400-500 people died
- 48,000 were hospitalized
- 4,000 developed encephalitis

How effective is the measles vaccine?
- One dose is about 93% effective if exposed
- Two doses are about 97% effective
- Not clear why 3% fail the vaccine
- Fully vaccinated people who get the disease are much more likely to have a milder illness and less likely to spread to other people

Postexposure Prophylaxis (PEP)
MMR Vaccine
- Administer within 72 hours of exposure
- May return to normal activities (except healthcare settings)
- Still monitor for symptoms
- Can be given down to age 6 months
- Be aware of possibility of vaccine rash

2013 ACIP Recommendations at [http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6204.pdf](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6204.pdf)
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Postexposure Prophylaxis (PEP) Immune Globulin

- Administer within 6 days of exposure

- Recommended Dose
  - Intramuscular (IGIM): 0.5 mL/kg (max = 15 mL)
  - Intravenous (IGIV): 400 mg/kg

- Recommended for the following groups (risk of severe disease and complications)
  - Infants aged <12 months (IGIM)
  - Pregnant women without evidence of immunity (IGIV)
  - Severely immunocompromised patients (IGIV)

and 2013 ACIP Recommendations at http://www.cdc.gov/mmwr/Dr/6204.pdf

Currently Viewing: Combined 3 Vaccine Series - Age >= 19-23 Months => Coverage in 2017

Legend (%)

- 64.4 - 70.0
- 70.9 - 75.5
- 76.6 - 81.0
- 82.1 - 86.2
- 86.4 - 90.4
- 90.6

POMA 111th Annual Clinical Assembly & Scientific Seminar
May 1-4, 2019
This is Ben. He is immunocompromised and cannot be vaccinated. But thanks to community immunity, he is protected from major diseases.

By vaccinating, you are not only protecting yourself and your children, but also people unable to be vaccinated.

Every year, 1.5 million children die because they weren't vaccinated.
What Should Clinicians Do?

Discuss the importance of MMR vaccine with parents. Listen and respond to parents’ questions. When parents have questions, it does not necessarily mean they won’t accept vaccines. Sometimes, they simply want your answers to their questions.

Ensure all patients are up to date on measles, mumps, rubella (MMR) vaccine.

Children need 2 doses of MMR: one dose at 12-15 months and another dose at 4-6 years.

Before any international travel, infants 6-11 months need 1 dose of MMR vaccine, children 12 months and older need 2 doses separated by at least 28 days, and teenagers and adults who do not have evidence of immunity against measles need 2 doses separated by at least 28 days.

Consider measles in patients presenting with febrile rash illness and clinically compatible measles symptoms (cough, coryza, and conjunctivitis), and ask patients about recent travel internationally or to domestic venues frequented by international travelers, as well as a history of measles exposures in their communities.

Promptly isolate patients with suspected measles to avoid disease transmission and immediately report the suspect measles case to the health department.

Obtain specimens for testing from patients with suspected measles, including viral specimens for genotyping, which can help determine the source of the virus. Contact the local health department with questions about submitting specimens for testing.

https://www.cdc.gov/measles/hcp/index.html
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United States Mortality Rates

Immunizations save lives
Know it