Yersiniosis - An Overview

The Infectious Agent

The causative agent of yersiniosis is usually *Yersinia enterocolitica*. This is a small, gram-negative rod that grows under both aerobic and anaerobic conditions. It is often found in the feces of animals especially pigs. It can also be found in other barnyard animals such as cattle, horses, and sheep.
In this photomicrograph, *Y. enterocolitica* has been stained with Leifson's flagella stain to make the flagella visible. Courtesy of CDC.

The organism was first described in 1934 by McIver and Picke. The first human isolates were identified in 1939.

*Yersinia pseudotuberculosis*, another species in this genus, can also cause similar symptoms but usually they are more severe. *Yersinia fredericksenii* is a potential human pathogen when isolated from extra-intestinal sites.

**Mode of Transmission**

The primary means of transmission of *Y. enterocolitica* is via the ingestion of contaminated foods particularly pork. People who handle pork intestines in the process of making chitterlings are particularly susceptible. Since this organism can multiply at refrigerator temperatures, unpasteurized milk and products made from it are also a source of transmission.

Transmission via blood products occurs and yersiniosis can be transmitted from the mother to a newborn.

Person-to-person transmission (fecal/oral) may occur but it has never been documented.

**Epidemiology**

Although over 60 serotypes of *Y. enterocolitica* have been identified, most cases of yersiniosis in humans are caused by four serogroups: O:3; O:5; O:8 and O:9.

Yersiniosis is relatively rare in the U.S. except when there has been a breakdown in food processing. CDC estimates that there are about 17,000 cases of yersiniosis occurring annually in the U.S.

Yersiniosis occurs worldwide but the majority of cases occur in cooler climates such as Northern Europe, Japan and Scandinavia.

The vast majority of patients with *Yersinia* infections are asymptomatic or have only mild symptoms. In the case of those patients who do exhibit symptoms, death is quite rare. However, in the case of patients who go on to develop bacteremia, the death rate can approach 35 to 50%.

In recent years, *Y. enterocolitica* has emerged as a significant source of transfusion-associated bacteremia. In this cases, mortality is 64%.

There is no difference in infection rates between males and females and between various ethnic groups. However, erythema nodosum appears to be more common in females.
Most infections (78%) occur in children age one year or younger making this the second most common gastrointestinal infection among children (after rotavirus).

Clinical Presentation

The most common clinical presentation associated with Yersinia infection is diarrhea. This is usually accompanied by abdominal pain and fever and the symptoms generally persist for one to three weeks. In severe cases, the diarrhea may be bloody. In about 15 to 40% of cases, there may also be vomiting.

About 4 to 5% of cases are accompanied by symptoms resembling appendicitis and some end up undergoing appendectomy. This "pseudoappendicitis" is usually characterized by fever, abdominal pain, tenderness of the right lower quadrant and leukocytosis.

Other conditions associated with infection include:

- Reactive arthritis: usually reported in Scandinavia and associated with the HLA-B27 antigen. The most common joints implicated are the large joints of the legs
- Myocarditis
- Glomerulonephritis
- Erythema nodosum: painful, raised, red or purple lesions usually found on the lower extremities. They appear two to 20 days after the onset of fever
- Septicemia - most common in persons with certain underlying conditions such as diabetes, immune defects and alcoholism

Diagnosis

When \textit{Y. enterocolitica} is suspected, the laboratory should be informed so that special culture media can be included in stool examinations. Some labs do this as a matter of routine. CIN agar is a special differential medium that yields increased results for \textit{Yersinia}. This medium is incubated at 25°C for best results. Since it is a slower grower, it is often overgrown on conventional culture media such as MacConkey agar.

Following acute infection, IgM and IgG antibodies specific to \textit{Y. enterocolitica} are usually present. These are hard to interpret in the absence of a positive stool specimen.

\textit{Yersinia enterocolitica} growing on Hektoen agar. This is a common culture medium used for stool cultures. The colonies are light green since this organism does not ferment lactose

\textit{Yersinia enterocolitica} growing on XLD agar - a very selective agar for this organism

Treatment

In the case of uncomplicated gastroenteritis, antimicrobial therapy is usually \textbf{not} recommended and the patient should be treated with hydration measures.

In the case of severe gastroenteritis, bacteremia and extraintestinal complications, antibiotics are recommended. Isolates are usually susceptible to sulfamethoxazole-trimethoprim (Bactrim®), fluoroquinolone-
lones, tetracyclines, cefotaxime and chloramphenicol (but the latter is not usually recommended). Most isolates are usually resistant to first-generation cephalosporins and most of the second generation ones. They are also resistant to the penicillins.

**Infection Control Practices**

The Centers for Disease Control and Prevention have recommended the following steps be taken to prevent yersiniosis:
- Avoid eating raw or undercooked pork,
- Avoid consuming unpasteurized milk or products prepared from it, such as soft cheeses,
- Wash your hands thoroughly with soap and water before eating and preparing food, especially when handling raw meat,
- Wash hands thoroughly after contact with animals,
- After handling raw chitterlings (made from pig's intestines), clean hands and fingernails scrupulously with soap and water before handling infants, their toys, bottles or pacifiers. Someone other than the food handler should care for children while chitterlings are being prepared,
- Prevent cross-contamination in the kitchen:
  - Use separate cutting boards for meat and other foods,
  - Carefully clean all cutting boards, counter-tops and utensils with soap and hot water after preparing raw meat,
  - It is recommended that ceramic cutting boards be used instead of wooden ones and that they be disinfected with a freshly prepared solution (1:10 to 1:20) of household bleach,
- Dispose of animal feces in a sanitary manner.

William F. Vincent, Ph.D.
Quest Diagnostics
Wallingford, CT

**Selected References**


Centers for Disease Control and Prevention. 2009. *Yersinia* - General Information. Click here to access this website.

Centers for Disease Control and Prevention. 2010. *Yersinia enterocolitica* and pigs. Click here to access this website.


**Want to Contact A Quest Diagnostics Representative?**

If you would like a Quest Diagnostics representative to call on your office or facility, you can use the links below to arrange for such a visit.

For a physician representative, click here.

For a hospital representative, click here.

**Other Infectious Disease News**

**Immunization of Health Care Personnel:**

**Recommendations of the Advisory Committee on Immunization Practices (ACIP) Published Verbatim Summary**

This report updates the previously published summary of recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Hospital Infection Control Practices Advisory Committee (HICPAC) for vaccinating healthcare personnel (HCP) in the United States.

The report summarizes all current ACIP recommendations for vaccination of HCP and does not contain any new recommendations or policies. The recommendations provided in the report apply, but are not limited to,
HCP in acute-care hospitals, long-term-care facilities (e.g., nursing homes and skilled nursing facilities), physicians’ offices, rehabilitation centers, urgent care centers and outpatient clinics as well as to persons who provide home health care and emergency medical services.


**CDC Publishes New Guidelines for Treating TB**

New regimen will make treatment simpler and easier (verbatim press release 8 December 2011)

Health care providers in the United States have a new way to treat latent tuberculosis infection, according to recommendations released today by the Centers for Disease Control and Prevention. The new recommendations, published today in CDC’s Morbidity and Mortality Weekly Report, provide guidance on how to administer a new 12-dose regimen for TB preventive therapy that will significantly shorten and simplify the course of treatment from about nine months to 12 weeks. The recommendations are based on the results of three clinical trials, as well as expert opinion.

The recommendations follow results from the largest of those clinical trials, first announced in May 2011 and published this week in the New England Journal of Medicine. That multi-national clinical trial conducted by CDC’s TB Trials Consortium found that a once-weekly regimen of the anti-TB drugs rifapentine and isoniazid taken as part of directly observed therapy over a period of three months was as effective in preventing TB disease as the standard self-administered nine-month daily regimen of isoniazid alone, and was completed by more patients. The new regimen has a significant benefit over the previous standard of treatment by cutting the doses required from 270 daily doses to 12 once-weekly doses.

“This regimen has the potential to be a game-changer in the United States when it comes to fighting TB,” said CDC Director Thomas R. Frieden, M.D., M.P.H. “It gives us a new, effective option that will reduce by two-thirds – from nine months to three months - the length of time someone needs to take medicine to prevent latent TB infection from progressing to active TB disease.”

Latent TB infection occurs when a person has TB bacteria but does not have symptoms and cannot transmit the bacteria to others. If the bacteria become active, the person will develop TB disease, become sick, and may spread the disease to others. Although not everyone with latent TB infection will develop TB disease, some people, such as those with weakened immune systems, are at higher risk of progression to TB disease. Many of those at high risk of developing TB disease never even begin the cumbersome nine-month course of standard treatment, and among those who do, many do not complete it.

In the United States, the number of persons with TB disease is at an all-time low (11,182 total cases were reported in 2010); however, approximately four percent of the U.S. population, or 11 million people, are infected with the TB bacterium. TB continues to disproportionately affect people of color and foreign-born persons in the U.S..

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*Mycobacterium tuberculosis* (stained red) in an acid-fast stain of sputum

_Courtesy of CDC_

“If we are going to achieve our goal of TB elimination in the United States, we must ensure that those with latent TB infection receive appropriate evaluation and treatment to prevent their infection from progressing to TB disease and possibly spreading to others,” said Kevin Fenton, M.D., director of CDC’s National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention. “It is critical that we accelerate progress against TB in the United States in order to avoid a resurgence of the disease.”

**Highlights of the recommendations**

The new 12-dose regimen adds another effective treatment option to the prevention toolkit for TB, and is not meant to replace other preventative treatment regimens for all patients where the new regimen is not the best option. Major components of the recommendations for this regimen include:

- Provision of 12 once-weekly doses via directly observed therapy: The new regimen consists of 12 once-weekly doses of rifapentine and isoniazid,
Doses should be taken under the supervision of a healthcare worker to ensure completion of doses and to allow for monitoring of safety among patients. Clinicians should rule out TB disease among all patients before beginning the two-drug regimen.

Regimen is recommended for otherwise healthy people age 12 and older who are at high risk for developing TB disease: This includes anyone who has had recent exposure to contagious TB, conversion from negative to positive on a test for TB infection, or a chest X-ray indicating prior TB disease. Persons living with HIV who are otherwise healthy and not taking anti-HIV medications (antiretrovirals) may also use this regimen if TB preventive treatment is indicated.

Public health officials may also consider use of this regimen among populations that are unlikely to complete nine months of daily therapy (e.g., in correctional settings, clinics for recent immigrants, homeless shelters). Use should be considered on a case-by-case basis among children between the ages of two and 11, and patients with underlying conditions associated with TB.

Regimen is not recommended for certain groups. Because the safety of the regimen for some patients is unknown, it is not recommended for use among children under the age of two, women who are pregnant or planning to become pregnant, and HIV-infected persons taking antiretrovirals. Patients whose TB infection is presumed to be the result of exposure to a person with TB disease that is resistant to one of the two drugs should not receive this regimen.

Monitoring for adverse events is critical: Healthcare workers supervising patients who are taking the drugs should educate patients and monitor for possible adverse effects, and report any problems to a clinician. Patients should undergo a clinical assessment at least monthly.

CDC is increasing awareness of the new treatment option among clinicians and public health professionals. Efforts under way by CDC’s Division of Tuberculosis Elimination include developing educational materials on the proper use of the new treatment regimen, outreach to multiple networks of clinicians and physicians, and collaborating with the four CDC-funded Regional Training and Medical Consultation Centers to further educate TB programs about the guidelines. CDC is also assessing whether self-administered use of the 12-dose regimen is feasible and will result in similar levels of adherence. Additionally, CDC is working with the American Thoracic Society and the Infectious Diseases Society of America to update full public health guidelines for finding and treating latent TB infection.

CDC officials note that these recommendations are only for the United States. Countries with a high incidence of TB, especially those with high HIV prevalence and where the risk of TB re-infection is greater, will likely require additional studies before considering whether to recommend this regimen.

For more information, please visit www.cdc.gov/tb.


Babesiosis among The Elderly
A recent article in Emerging Infectious Diseases reports on an increase in babesiosis among the elderly, especially those living in the Northeastern United States (where the incidence of this parasitic disease is the greatest). Many of the cases appear to be related to transfusions, according to Medicare databases. At present, there is no screening test for the presence of B. microti in a unit of blood.

In the very center of this photomicrograph of a Giemsa stained blood smear is a trophozoite of B. microti. This tetrad structure is very similar to that of Plasmodium falciparum, one of the causative agents of malaria.

Babesiosis is caused by the blood parasite, Babesia microti, which is very similar to the members of the genus Plasmodium, the causative agents of malaria. It appears to have originated on Martha's Vineyard off Cape Cod and eventually spread along the New England coast and then inland. It is commonly known as “Nantucket Fever”
The vector for the organism is the Deer tick (*Ixodes scapularis*). This same tick is responsible for the spread of Lyme borreliosis and anaplasmosis.


**Free CME/CEU credits**

**Probiotics stave off infection in TBI patients.** Courtesy of MedPage Today. Click [here](#) to access offering.

**C. difficile infection makes hospital stays longer.** Courtesy of MedPage Today. Click [here](#) to access offering.

**Hospitals do more to prevent infections.** Courtesy of MedPage Today. Click [here](#) to access offering.

**Maggots quickly clear chronic leg ulcers.** Courtesy of MedPage Today. Click [here](#) to access offering.

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The authors of this article state that encroachment by humans into area where there are deer and ticks may play a major role. In many areas of Southern New England it is virtually impossible not to encroach on their territory. It is not uncommon to see senior citizens strolling along the beautiful paths we have here in New England. With bushes along the trails (where the ticks hang out looking for a dinner), this may not be such a hot idea. Persons outside in this neck of the woods should “dress to repel”. This means using 20% DEET or higher and spraying your clothes with permethrin. Also, it means not wearing halter tops, shorts, etc. Of course, checking yourself for ticks after being outdoors is always an excellent idea.


Centers for Disease Control and Prevention. 2010. Babesiosis FAQ. Click [here](#) to access website.

**Bacteria in Public Restrooms**

Investigators from the University of Colorado in Boulder conducted a study to determine what bacteria might be lurking in public restrooms. They used novel genetic sequencing methodology to determine the original source of bacteria found on doors, floors, faucet handles and toilet seats.

Two really interesting results from this study were as follows:

- There was **no** difference between male and female restrooms,
- The human skin was the **primary** source of bacteria on **all** sources (not urine or feces).


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**Relationship of Migraine Headaches with *Helicobacter pylori* Infections**

Researchers in Poland studied IgG and IgM antibodies towards *Helicobacter pylori* in patients with migraine headaches as compared to a control group.

They found that there was a significant difference in both types of antibodies in patients suffering from migraine headaches. They also found that active infection was related to the severity of these headaches.


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**Colistin - An Old Antibiotic Reintroduced**

Colistin (polymyxin E) was introduced about 50 years ago but disappeared use to its nephrotoxic effects. It is now being re-evaluated for use against carbapenem-resistant gram-negative organisms. Its nephrotoxicity is reversible in most patients and its use is better than **no** effective treatment at all.

Two-Thirds of Medical Students don't know When to wash Their Hands
A study in Germany on 85 first-year medical students indicated that roughly two-thirds of them didn't know when and when not to wash their hands.

In addition, the students often felt that their hand hygiene practices would be "good" while those of the nursing staff were not.


Hepatitis C is now A Bigger Killer than HIV
Researchers from the Centers for Disease Control and Prevention examined death certificates starting in 1999 and found that in 2006, the death rate from HIV infections and Hepatitis C infections crossed.

The result is that now the death rate from Hepatitis C infection exceeds that from HIV infection.


Effect of Probiotic in Preventing Healthcare-associated Diarrhea in Children
Investigators combed through numerous databases to determine the effect of the probiotic, *Lactobacillus rhamnosus* GG (LGG), on healthcare-associated diarrhea in children age one month to 18 years.

They found that in 1,092 hospitalized children, the use of LGG suspensions administered starting on admission reduced the overall incidence of healthcare-associated diarrhea in these children including those cases caused by rotavirus.


CMV and Salivary Gland Cancer
Researchers in California used immunochemical staining techniques to look for a protein (IE1) in tumor cells from salivary glands. This protein is a marker for active human cytomegalovirus (hCMV) infection. They found it to be present in 38 out of 39 cases of mucoepidermoid carcinoma. It was not present in adjacent, unaffected tissue or in normal glands.


The Use of Gloves reduces Hand Hygiene
Investigators in the UK examined seven thousand patient contacts in 15 hospitals and found that adequate hand hygiene was only 47.7 % which they termed "disappointingly low". When latex gloves were worn, the compliance dropped to around 41 %. The investigators referred to this as the "dirty hand in the latex glove".

Fuller, C. et al. 2011. "The dirty hand in the latex glove": a study of hand hygiene compliance when gloves are worn. *Infection Control and Hospital Epidemiology* 32: 1194-1199. Click here to access abstract.

Unusual Microorganisms
*Bartonella henselae*
*B. henselae* is the etiologic agent of cat scratch disease (CSD). It is a gram-negative intracellular parasite that has a preference for red blood cells. Humans acquire CSD by being scratched or bitten by cats. The disease is usually mild with fever, swollen lymph nodes headache and fatigue. Occasionally cases can develop into more serious diseases such as hepatitis, endocarditis and encephalitis.

Cats carrying *B. henselae* show no evidence of disease. About 40 % of cats will carry this organism at some point in their lives. Fleas can also become infected but there...
is no evidence that they can transmit the disease to humans.


Centers for Disease Control and Prevention. 2010. Cat Scratch Fever (Bartonella henselae infection). Click here for access to website.

New Tests from Quest Diagnostics

OraRisk® HPV with Reflex

Clinical Significance
This test identifies the presence of HPV and HPV type (high through low risk) to enable clinicians to determine and initiate appropriate monitoring or referral for patients who have positive results

Specimen requirements
5 mL oral rinse using special OraRisk® HPV kit:
1) Print patient’s name and date of birth on collection tube label - place lengthwise on tube,
2) Ask patient to vigorously swish and gargle for 30 seconds with provided saline,
3) Ask patient to spit into labeled collection tube. Tightly seal with green screw cap and place in transport bag.

Specimens containing less than 1 mL of oral rinse in collection tube will be rejected.

Specimen Transport and Stability
Specimens should be transported at room temperature. Specimens can be refrigerated or frozen for up to 14 days.

Set-Up/Analytic Time
Set up: as needed; reports available in 7 to 9 days

Methodology
Polymerase chain reaction

Performing Site
OralDNA (UYD)

Additional Information
If the OraRisk® HPV result is detected, then genotyping will be performed at an additional charge.

Trichomonas vaginalis RNA, Qualitative TMA, Males
** This test is not available for New York patient testing** There is no alternative for New York patients

Purpose of Test
This test is used to detect Trichomonas vaginalis in clinical specimens from males. The test has greater analytical sensitivity than culture methods.

Specimen Requirements
Male urethral swab in APTIMA® Unisex Swab Specimen Collection Kit or random urine (male) in APTIMA® Urine Specimen Collection Kit:
1) Male urine: the patient should not have urinated for at least one hour prior to specimen collection. The patient is to provide a first-catch urine (approximately 20-30 mL of the initial urine stream) into a urine collection cup free of any preservatives. Collection of larger volumes of urine may result in specimen dilution that may reduce test sensitivity. 2 mL of urine specimen must be transferred into the Gen-Probe Aptima® Urine transport as soon as possible or within 24 hours of collection and before being assayed. Urine specimens must be refrigerated pending transfer into Aptima transport medium, 2) Urethral swabs: follow instructions in the Aptima® Unisex Swab Collection Kit package insert for endocervical and urethral swab preparation.

Rejection Criteria
Vaginal swabs; female urine

Transport temperature
Room temperature
Specimen Stability
Both urine specimens and urethral swabs are stable for 30 days when stored at room temperature or refrigerated. Frozen specimens are stable for up to six months.

Set-Up/Analytic Time
Set up: Monday - Thursday; Report available in 2 to 5 days

Reference Range
Not detected

Methodology
Transcription mediated amplification (TMA)

Performing Site
Quest Diagnostics Nichols Institute
From The Editor's Desk

DRIFT BOAT FISHING ON THE SALMON RIVER
Just about every year, the Editor and one of his friends go on a fishing trip on the Salmon River in Pulaski, NY. This river runs into Lake Ontario and has legendary king salmon, steelhead (sea-run rainbows) and brown trout runs.

This year, we went up the day after Thanksgiving. Last year, the weather was exceptionally bad and we ran into a "lake effect" storm which dumped 6 inches of snow into our drift boat in about half an hour. This year the weather was almost balmy - around 60°F. That's exceptionally nice for this area during this time of the year.

This picture was taken as we headed out in the morning. You can see the anglers in waders lined up along the bend in the river.

The Editor took a nice 6-8 lb steelhead right under their noses. That's the advantage of being in a drift boat.

Also, it's great being able to sit down in a dry spot rather than standing in ice cold water.

Fishing from a drift boat is not exactly cheap and you have to make certain that you have an experienced guide with good equipment. Tony, our guide, was great and knew right where the fish were.

Richard Cagna, MD of Windsor Locks, CT with a very nice steelhead. He was jumping around like a little kid on Christmas morning.