

Medical News

Volume XVIII Number 10
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William F. Vincent, Ph.D.
Senior Editor

We would Like to Hear from You

The vast majority of feature articles that appear in our *Infectious Disease Update* come about because somebody asked for them.

Often at meetings or during informal conversations, somebody will say: "Why don't you write something about this particular subject?" Invariably, if it's important enough for one person to be interested in it, then there's an excellent chance that additional readers would like to hear about that subject.

Additionally, you might come across an article in a journal that you feel should be brought to the attention of other professionals. Just let us know the name of the journal, the volume, the month, and the page and we'll try to include it in a forthcoming issue.

To contact the Editor, just click [here](#).

Listeriosis - An Overview

The Organism

Members of the genus *Listeria* are small, gram-positive rods but, due to their pleomorphism, they often appear as cocci or gram-negative rods under the microscope. The genus was named after Joseph Lister, The Father of Disinfection. The organism is a facultative anaerobe which can be grown in the laboratory on appropriate culture media.

One of the most novel characteristics of all species in this genus is the "tumbling motility" associated with them. When examined under the microscope in a hanging drop or under a darkfield microscope, the organism exhibits a characteristic motility in that they tumble end-over-end instead of in a steady, smooth motion. The organisms are motile at 30°C but not at 37°C.

Another distinguishing feature of this genus is its ability to grow reasonably well at refrigerator temperatures.

Of the several species in the genus, the only one that is pathogenic for man is *Listeria monocytogenes*. Both *L. monocytogenes* and *Listeria ivanovii* are pathogens for mice. Other species in the genus include *Listeria innocua*, *Listerialeshimeri*, *Listeria seegligeri* and *Listeria grayi*.

History

The disease was first described in 1926 by E.G.D. Murray who isolated it from six young rabbits that had died suddenly. At that time, he named it *Bacterium monocytogenes*. The name was later changed to *Listeria monocytogenes* in 1940. In some old texts, the name "Listerella" appears.

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Even though cases of infection in both humans and animals were observed for a considerable period of time, it wasn't until 1952 that the organism was recognized as the cause of neonatal sepsis and meningitis. It was not recognized as a foodborne pathogen until 1981 when it was demonstrated to be the causative agent of an outbreak of listeriosis in Halifax, Nova Scotia which involved 41 cases leading to 18 deaths. Since that time, listeriosis has become well recognized as an important foodborne pathogen.

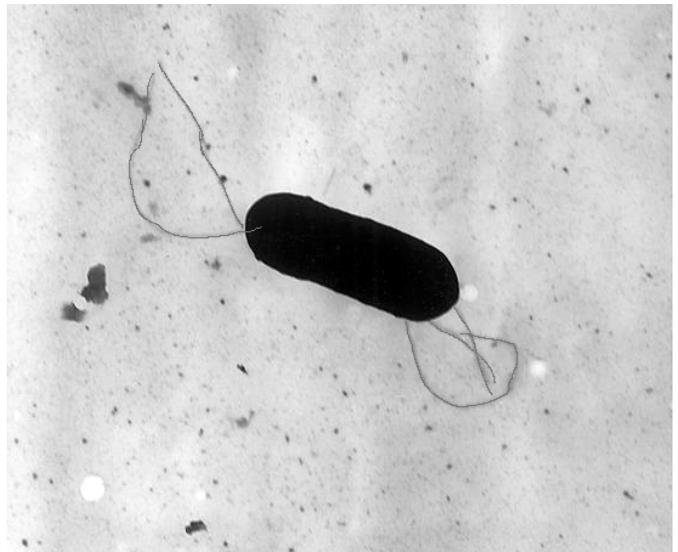
The Organism

Listeria monocytogenes is found in soil, water, sewage and decaying vegetation. It has been isolated from many sources in nature including domestic and wild animals, birds, fish and shellfish. Studies have shown that a small percentage of perfectly healthy humans (1 to 5 %) may harbor this organism in their GI tract.

Although the organism is not a spore former, it is very hardy and can survive quite nicely for long periods of time even when subjected to freezing, drying and heat.



Colorized electron micrograph of *Listeria monocytogenes* in a brain abscess of a newborn infant
Courtesy of CDC



Electron micrograph showing the flagella of *Listeria monocytogenes*
Courtesy of CDC

The Organism - Continued

L. monocytogenes is capable of growing over a wide pH range which allows it to survive and multiply in a number of foods. One of the unusual characteristics of this organism is its ability to multiply (although slowly) in refrigerated foods. As a result, a very small, basically harmless population of *L. monocytogenes* in a food product can eventually reach a number that will provide an inoculum large enough to cause disease.

L. monocytogenes owes its pathogenicity in great part to its ability to invade the cells of the host's reticuloendothelial system. This provides protection to the bacteria and they are not phagocytized by the white cells.

Not all strains of *L. monocytogenes* are virulent and the test that has been used in the past to determine whether an isolate of *L. monocytogenes* is virulent (e.g. capable of causing disease) or not is called the "Ocular Test of Anton". In this test, a colony of the isolate is suspended in sterile water and inoculated into the conjunctiva of one of a rabbit's eyes. The other eye serves as a control. A positive test is the development of a purulent conjunctivitis in the inoculated eye.

Diseases Produced

In the average, healthy or non-pregnant individual, infection results in no symptoms or a very mild disease with flu-like symptoms including fever, muscular aches, and occasionally diarrhea and nausea.

Those persons at **highest risk** for serious disease are pregnant women, their fetuses and their newborn infants. Also at high-risk are immunocompromised individuals.

It appears that the reason pregnant women are more susceptible to *L. monocytogenes* infections may be due to changes in cellular immunity that occur during pregnancy. One example would be changes in the functions of T-lymphocytes.

Cases of listeriosis that are associated with pregnancy can be divided into two groups:

Early onset listeriosis - the fetus is infected while still *in utero* or during the first few days of life. Often, these infections result in spontaneous abortion or stillbirth. The common manifestation of these infections include meningoencephalitis, brain abscesses and pneumonia. The mortality rate in these infections is very high. Early onset disease is often referred to as "granulomatosis infantiseptica".

Late onset listeriosis - the infection does not become apparent until one to four weeks after birth. The most common symptom here is meningitis. Other symptoms include bacteremia and conjunctivitis.

In adults, the most common symptom associated with listeriosis is meningitis. Most symptomatic cases occur among severely immunocompromised or immunosuppressed persons. Persons who are undergoing organ transplant or chemotherapy are particularly at risk. Another complication that may occur in adults is endocarditis.

Epidemiology and Transmission

CDC has estimated that there are approximately 1,800 cases of listeriosis annually resulting in more than 400 deaths. The number is most probably considerably higher because of mild and asymptomatic infections.

Pregnant women comprise 30 % of all cases. Of those cases not involving pregnancy, about 70 % occur among immunocompromised persons. Due to changes in eating habits, the incidence in the U.S. has steadily declined.

Most cases of listeriosis are associated with contaminated hot dogs, deli meats and soft cheeses that have been made with unpasteurized (raw) milk. There have been several outbreaks involving produce products - alfalfa sprouts (2009), celery (2010) and cantaloupe (2011).

Until recently, the biggest outbreak in the U.S. was in 2002. That outbreak was tracked back to contaminated turkey deli meat and involved 54 cases of illnesses and 11 deaths.

In September of this year, an outbreak started involving contaminated cantaloupes from Colorado. As of October 4th, over 100 cases of disease involving 13 deaths were reported. This outbreak affected 28 states in the West and Midwest.

Diagnosis

If a person develops the symptoms and signs associated with listeriosis, the best means of diagnosis is to obtain cultures of blood and spinal fluid. There are immunological tests for antibodies but these are of limited value.

Studies are underway in several centers to develop rapid tests that can be performed on blood and CSF. Researchers in France recently reported on a Real-time PCR for this purpose.

Treatment

Because listeriosis is relatively rare, there have not been any definitive studies carried out to determine the antimicrobial agent to use. At present the most commonly used ones are penicillin, amoxicillin and ampicillin. These drugs are able to block the penicillin-binding proteins (PBPs) on the organism's cell wall and thus interfere with cell wall synthesis.

Dosing is very critical and experts recommend that a dose of six grams or more per day be used when treating pregnant women.

Infection Control

The following general recommendations have been suggested by CDC for reducing the risk for listeriosis:

- Thoroughly cook raw food from animal sources, such as beef, pork and poultry to a safe internal temperature. A list of recommended temperatures can be found at the USDA website by clicking [here](#)
- Rinse raw vegetables thoroughly under running tap water before eating
- Keep uncooked meats and poultry separate from vegetable and from cooked foods and ready-to-eat foods
- Do **not** drink unpasteurized (raw) milk and do not consume foods made from it (such as soft cheeses)
- Wash hands thoroughly with soap and water
- Wash knives, countertops, and cutting boards thoroughly after handling and preparing uncooked foods
- Consume perishable and ready-to-eat foods as soon as possible

CDC has also prepared special recommendations for persons at high risk, such as pregnant women and persons with weakened immune system. In addition to the recommendations listed above, the following recommendations should be followed for these groups:

- Meats:
 - Do **not** eat hot dogs, luncheon meats, cold cuts, other deli meats (e.g. bologna) or fermented or dry sausage unless they are heated to an internal temperature of 165°F or until steaming hot just before serving
 - **Avoid** getting fluids from hot dog or luncheon meat packages on other foods, utensils and food preparation surfaces. Wash hands after handling hot dogs, luncheon meats and deli meats
 - Do **not** eat refrigerated pâté or meat spreads from a deli or meat counter or from the refrigerated section of a store. Foods that do not need refrigeration, like canned or shelf-stable pâté and meat spreads, are safe to eat but should be refrigerated after opening
- Cheeses
 - Do **not** eat soft cheeses such as feta, queso blanco, queso fresco, brie, Camembert, blue-veined or panela (queso panela) unless it is labeled as being made from pasteurized milk,

Make sure the label reads "**MADE WITH PASTEURIZED MILK**"

- Seafood
 - Do **not** eat smoked seafood, unless it is part of a cooked dish, such as a casserole or unless it is a canned or shelf-stable product. Refrigerated smoked seafood, such as salmon, trout, cod, tuna and mackerel, is most often labeled "nova-style:", "lox", "kippered", "smoked" or "jerky". These fish are typically found in the refrigerated section or sold at seafood and deli counters of grocery stores and delicatessens. Canned, and shelf-stable tuna, salmon, and other fish products are safe to eat.

CDC has published the following recommendations to keep food safe:

- Be aware that *L. monocytogenes* can grow in foods in the refrigerator. Use an appliance thermometer, such as a refrigerator thermometer, to check the temperature inside your refrigerator. The refrigerator section should be 40°F or lower and the freezer 0°F or lower
- Clean all spills in your refrigerator as quickly as possible - especially juices from hot dog and luncheon meat packages, raw meat and raw poultry
- Divide leftovers into shallow containers to promote rapid, even cooling. Cover with airtight lids or enclose in plastic wrap or aluminum foil. Use leftovers within three to four days
- Use precooked or ready-to-eat foods as soon as you can. Do not store these foods in the refrigerator beyond the "Use by" date on the package.
- Follow USDA refrigerator storage times guidelines:
 - **Hot dogs** - store opened package no longer than one week and unopened packages no longer than two weeks in the refrigerator
 - **Luncheon and deli meat** - factory-sealed, unopened packages can be stored no longer than two weeks. Stored opened packages and meat sliced at the local deli no longer than three to five days in the refrigerator

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Selected References

Centers for Disease Control and Prevention. 2011. Listeriosis. (*Listeria* infection). Click [here](#) to access the website.

Centers for Disease Control and Prevention. 2011. Multistate outbreak of listeriosis linked to whole cantaloupes from Jensen Farms, Colorado. Click [here](#) to access most recent report.

Janakirman, V. *et al.* 2008. Listeriosis in pregnancy: diagnosis, treatment and prevention. *Reviews in Obstetrics and Gynecology* 1: 179-185. Click [here](#) to access the complete article.

Mayo Clinic. 2011. *Listeria* infection. Click [here](#) to access the website.

U.S. Food and Drug Administration (FDA). 2011. "The Bad Bug Book" Foodborne Pathogenic Microorganisms and Natural Toxins Handbook. *Listeria monocytogenes*. Click [here](#) to access website.

Other Infectious Disease News

Guidelines for Pediatric Pneumonias Published.

These are the first-ever guidelines published by the 13-member panel. The areas covered in these guidelines include:

- Recommendations for diagnosis,
- Hospitalization based on symptoms,
- Strong immunization recommendations,
- Recommended antimicrobial therapy,
- Management of the child not responding to therapy,
- Prevention measures

Readers who routinely treat infants and children under 3 years of age will find the guidelines of value.

Bradley, J.S. *et al.* 2011. Management of community-acquired pneumonia in infants and children older than 3 months of age: Clinical practices guidelines by Pediatric Infectious Disease Society and Infectious Disease Society of America. *Clinical Infectious Diseases*. Published on-line. Click [here](#) to access entire document.

Pathogens and Hospital Uniforms

You put on a clean, thoroughly washed uniform each day and feel that you are doing your job to prevent the spread of infections in your facility. Sorry! Close but no brass ring.

According to a recent study conducted in a major hospital in Israel, more than 60 % of the physicians' coats and nurses' uniforms tested positive for the presence of methicillin-resistant *Staphylococcus aureus* (MRSA).

The investigators made a number of suggestions based on their findings:

- Whenever there appears to be a chance that a uniform could become contaminated with body fluids, plastic aprons should be worn,
- Short sleeved coats and uniforms allow for better hand hygiene and should be implemented,
- Physicians should be encouraged to give up the use of white coats.

In addition to MRSA, a number of other pathogens were isolated including:

Acinetobacter sp.: 37 % of samples

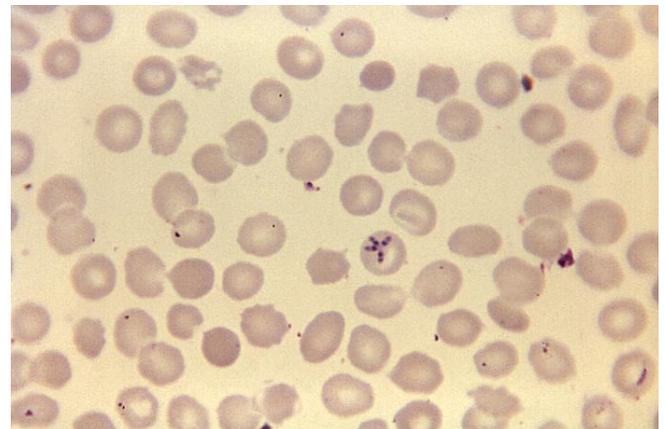
Staphylococcus aureus (MSSA): 13 %

Enteric bacteria: 8 %

Wiener-Well, Y. *et al.* 2011. Nursing and physician attire as possible source of nosocomial infections. *American Journal of Infection Control* 39: 556-559. Click [here](#) to access abstract.

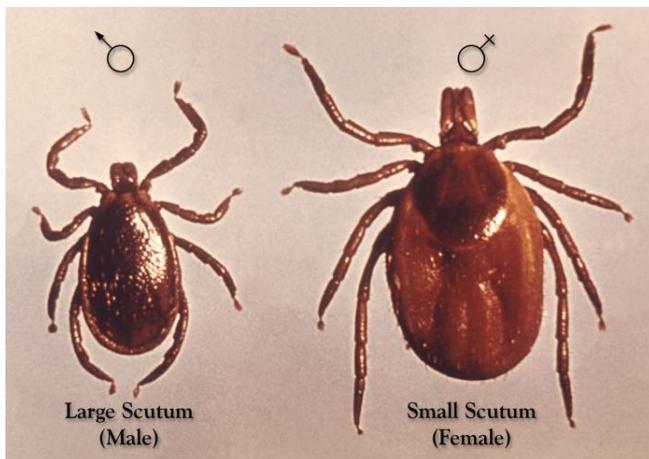
Babesiosis associated with Transfusions

Babesiosis is a parasitic disease transmitted by certain ticks. The causative agent, *Babesia microti*, is an intracellular parasite that infects red blood cells.



***Babesia microti* trophozoite inside a red blood cell. This parasite very closely resembles *Plasmodium falciparum*, one of the causative agents of malaria**
Courtesy of CDC

The organism is transmitted from the white-footed mouse and other small animals by the black-legged or deer tick (*Ixodes scapularis*). This is the same tick responsible for the transmission of Lyme borreliosis in much of the country.



The Deer tick (*Ixodes scapularis*)
Courtesy of CDC

Many persons infected with this parasite remain asymptomatic. However, for some, the infection can lead to a life-threatening disease. This is particularly true in persons who have had their spleen removed, those with a weakened immune system, persons with serious health conditions and the elderly.

In a recent paper published in *The Annals of Internal Medicine*, it was reported that roughly 86 % of persons who developed babesiosis post transfusion probably were infected by the donor. This highlights the need for a screening test for this disease among donors. Unfortunately, no such test has been licensed yet.

Herwaldt, B.L. *et al.* 2011. Transfusion-associated babesiosis in the United States: a description of cases. *Annals of Internal Medicine*. Published online before print. Click [here](#) to access complete article.

How Many Cases of Hepatitis C-infected Persons are there in the U.S.?

It is believed that the actual estimate of cases of Hepatitis C in the U.S. is much higher than previously arrived at from other studies such as the recent National Health and Nutrition Examination Survey (NHANES). This survey included only civilians who were not institutionalized. Military personnel, homeless and drug users were not included in this survey.

Investigators went back and looked at these groups and came to the conclusion that the numbers should be adjusted upwards. Their estimate was that there are at least 5.2 million persons living with HCV of which 1.9 million were unaccounted for in the NHANES study.

Chak, E. *et al.* 2011. Hepatitis C infection in USA. An estimate of true prevalence. *Liver International* **31**: 1090-1101. Click [here](#) to access abstract.

Using Viruses to Kill Cancer Cells

Researchers at the Penn State College of Medicine are using a virus in the laboratory to kill cancer cells. They are presently studying the effect of Adeno-associated virus Type 2 (AAV2). This virus does not cause any disease in humans. Previously, the same investigators had shown that this virus will promote cell death in cervical cancer cells infected with human papillomavirus (HPV). They are presently studying the effect of this virus on cells derived from breast cancers and the results have been very promising.

PennStat Live. 2011. Virus kills breast cancer cells in laboratory. Click [here](#) to go the release.

Proton Inhibitors increase Risk of *Clostridium difficile* Infections (CDI)

Investigators in Japan carried out a retrospective study and came to the conclusion that the chronic use of proton pump inhibitors (PPIs) appear to increase the risk for *Clostridium difficile* infection (CDI) by as much as three-fold. They suggested that these drugs should be discontinued in those persons who do not really need them.

Kitazawa, T. *et al.* 2011. Does use of proton pump inhibitors increase incidence of *Clostridium difficile*-associated diarrhea? A Japanese study. Abstract K-201. 51st Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC). Presented September 17, 2011. Click [here](#) to go to abstract.

Free CME credits

Reducing the burden of *Clostridium difficile* infection (CDI) Spotlight on populations-at-risk.

Free CME offering from *Infectious Disease News*. Click [here](#) to go to offering.

DDW: Rifaximin cuts peritonitis in cirrhosis. Free CME offering from MedPage Today. Click [here](#) to go to offering.

Flu linked to 115 deaths among U.S. Children. Free CME offering from MedPage Today. Click [here](#) to go to offering.

Rotavirus vaccine cuts admissions, costs in young kids. Free CME offering from MedPage Today. Click [here](#) to go to offering.

Using Vancomycin Powder for Spinal Surgery

Investigators at Vanderbilt University found that the application of vancomycin powder to surgical site significantly **reduced** infections following spinal surgeries.

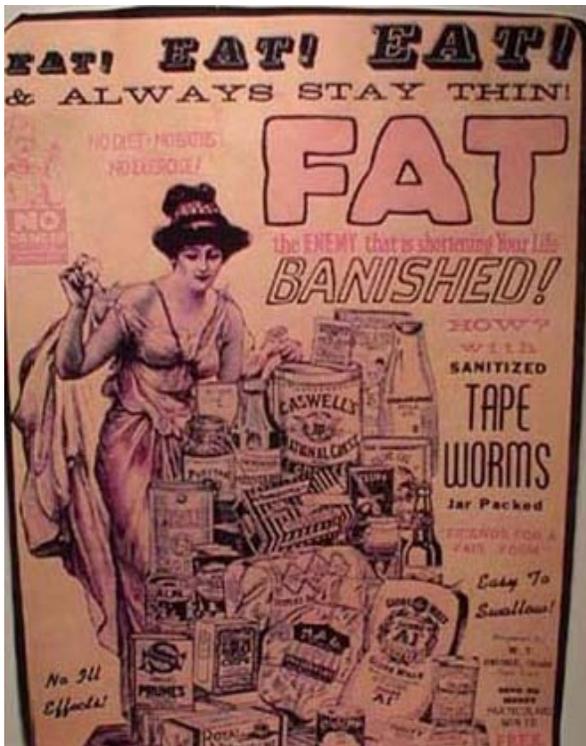
In the case of patients with traumatic spinal injury who underwent posterior spinal fusion, 13 % of the control group (no vancomycin) developed an infection. In the group treated with the vancomycin powder, there were **no** infections.

O'Neil, K.R. *et al.* 2011. Use of vancomycin powder reduced infection rates in spinal fusion. *Spine Journal* 11: 641-646. Click [here](#) to access abstract.

Can You imagine seeing this Ad in Magazines?

The ad below actually appeared in magazines at the turn of the 19th century. The strange part about this is that the use of tapeworms actually worked.

We're wondering which tapeworm they actually used. Our guess would be that it was *Diphyllobothrium latum* (the broad or fish tapeworm). How they "sanitized" them is anybody's guess.



An ad you don't see anymore!
In the Public Domain. Courtesy of Sue Gordon, MLT

New Test offerings from Quest Diagnostics

SureSwab® *Candida krusei* DNA

Clinical Significance

This test is used for the diagnosis of *Candida* vulvovaginitis

Specimen Requirements

Test requires a vaginal swab submitted in the Aptima® Swab collection Kit (orange label). Follow the instructions provided in the kit. Leaking samples uncapped samples, broken containers, and non-Aptima® vaginal swab collection kits will be rejected

Transport Temperature

Specimens should be shipped at room temperature. Specimens held at room temperature and refrigerated are stable for 14 days. Frozen specimen are stable for up to 30 days

Reference Range

No *C. krusei* DNA detected

Methodology

Real-time polymerase chain reaction (PCR)

Testing Laboratory

Quest Diagnostics Nichols Institute, San Juan Capistrano, CA

Clinical Significance

Used in the diagnosis of active Herpes simplex infection

Specimen Requirements

Liquid Cytology (PreserveCyt® preservative (ThinPrep®). Transfer 1 mL of PreserveCyt® solution into APTIMA® Specimen Transfer Tube (green label) or APTIMA Vaginal Collection Tube (orange label). Ship to lab. Specimens that have already been processed for cytology and specimens with excess mucus will be rejected

Transport Temperature

Transport specimen at room temperature. Specimens at room temperature are stable for 14 days. Refrigerated and frozen specimens are stable for 30 days

Reference Ranges

HSV 1 DNA: not detected

HSV 2 DNA: not detected

Methodology

Real-Time Polymerase Chain Reaction

Performing Site

Quest Diagnostics Nichols Institute, San Juan Capistrano, CA

Trichomonas vaginalis RNA, Qualitative TMA, Pap Vial

Clinical Significance

This test is used to detect *Trichomonas vaginalis* in clinical specimens. The test has greater analytical sensitivity than culture methods

Specimen Requirements

Liquid Cytology (PreserveCyt® preservative (ThinPrep®). Transfer 1 mL of PreservCyt® solution into APTIMA® Specimen Transfer Tube (green label) or APTIMA Vaginal Collection Tube (orange label). Ship to lab. Specimens that have already been processed for cytology and specimens with excess mucus will be rejected

Transport Temperature

Transport specimen at room temperature. Specimens at room temperature are stable for 14 days. Refrigerated specimens are stable for 30 days and frozen specimens for 6 months

Reference Range

No RNA detected

Methodology

Transcription-mediate amplification (TMA)

Performing Site

Quest Diagnostics Nichols Institute, San Juan Capistrano, CA

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Guest Editorial

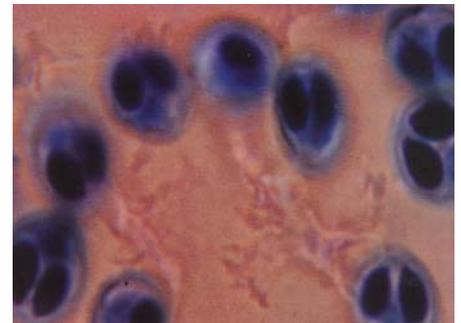
Felt Soled Shoes, Sushi and Microbiology

**Paul Cerwinka, MS, Projects Director
Microbiology Operations
Quest Diagnostics Incorporated**

I have found Microbiology to be so fascinating as it affects all aspects of our daily lives, including the sports we pursue and, of course, the food we eat.

For example, while a shoe with a sole made out of felt may sound like a really bad idea, it is actually a very effective way to walk in a stream or river without slipping on mud-covered rocks while fishing. The problem is, the felt gets saturated with mud and water containing microorganisms. This allows these microorganisms to be introduced into bodies of water thousands of miles away. A good example of this is rock snot which was brought to this country from New Zealand.

Another organism that can be tracked around via felt wading shoes is *Myxobolus cerebralis*. This is a parasite that affects fish like salmon and trout (which are favorite targets for this writer and the Senior Editor). Infections result in neurological damage to the young fish causing "Whirling Disease". The fish lose their ability to swim normally and end up going through the water in a corkscrew fashion. Not only is it difficult for them to feed but they become easy prey for other predators thus reducing the survival rates greatly. According to national studies, this disease causes significant damage to the fishing industry and 100's of millions of dollars in revenue may be lost annually.



**The spores of *Myxobolus cerebralis*
Courtesy of the U.S. Fish & Wildlife
Service**



**A Montana rainbow trout showing the distinct malformation often
associated with Whirling disease
Courtesy of the University of Montana**

This parasite does **not** infect humans, but when the fish dies, millions of parasitic spores are released in the body of water which can then infect other fish. The spores are very resistant to extremes of temperature and can survive as long as 20 years.

This disease is common in 22 states including New Jersey, New York, and Ohio to name just a few. It is also found in numerous European countries and in New Zealand. Prevention of its spread is best accomplished by cleaning all fishing equipment thoroughly and soaking felt-soled wading shoes or boots in a mild solution of bleach and water (1:10 to 1:20) just as we do in the laboratory.

So What does This have to do with Sushi?

Raw fish, such as sushi and salmon tartar, are considered delicacies and served in restaurants all over the world. To the right is a picture of the writer holding a delicious Alaskan silver salmon which could have been eaten raw (but wasn't!). Why? Because microbiologists know that fish can be infested with other parasites and, before consumption, it is important to cook it. An alternative is store the fish in a household freezer (about -20°C) for at least 72 hours before consuming it raw. By freezing the fish, you will kill harmful parasites that may be present such as *Diphyllobothrium latum*, the broad or fish tapeworm. This tape worm is capable of causing vitamin B₁₂ deficiency in its host.



The writer of this article with a beautiful silver salmon (Coho) was caught in Alaska in the Kenai River on a fly rod on August 26, 2011. Weight approximately 9 lbs



The broad or fish tapeworm (*Diphyllobothrium latum*) recovered from a person who had eaten raw fish. At the upper right is the head or scolex of the worm. The overall length of this worm is several yards
Public Domain

What does Freezing Actually do?

Freezing is thought to create ice crystals in the cytoplasm of the parasite's cell. These puncture the cell membranes on freezing and thawing. The FDA recommendations for retailers who provide fish intended for raw consumption are that it be frozen for -4°F (-20°C) or below for 7 days or -31°F (-35°C) or below for 15 hours.

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