The Genus *Escherichia* – An Overview

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**Historical**

The most common species in this genus, *Escherichia coli*, was first described by Theodor Escherich in 1885, a pediatrician living in Austria. Escherich eventually became convinced that the study of microbiology could solve most all problems in medicine, especially pediatrics. Subsequently, he went to Germany and France for advanced studies in microbiology that he couldn’t find in Austria. The flag mark species of this genus, *Escherichia coli* (which was originally named *Bacterium coli*), was later named after him.

Courtesy of CDC

The Genus

Members of this genus are approximately two microns in length and one micron in diameter. The organisms are rod-shaped, gram-negative and are usually covered with flagellae thus giving motility. They are also facultative anaerobes and are members of the family Enterobacteriaceae. Almost all isolates are lactose-fermenters which assists on initial identification.

For the most part, members of this genus are harmless but some strains can cause urinary tract infections and significant gastrointestinal disease. Normally, *E. coli* plays an important role in the overall function of the healthy human intestinal tract.

Species in This Genus

In addition to *E. coli*, which is widespread among humans and animals, there are a number of other species that have been identified. Among these are:

- *Escherichia albertii* – This is an emerging pathogen that has been associated with sporadic infections among humans and birds. It is sometimes difficult to distinguish between this species and shiga-toxin-producing strains of *E. coli*.
- *Escherichia fergusonii* – This species is known to cause wound infections, bacteremia and urinary tract infections,
- *Escherichia blattae* – This species is commonly found in the intestines of cockroaches. The organism has not been associated with any diseases in humans,
- *Escherichia hermannii* – This species is found in the wounds and feces of warm-blooded animals. *E. hermannii* is primarily an opportunistic pathogen and usually only causes infections in weakened and/or immunocompromised hosts. Infections include septicemia, purulent conjunctivitis, periodontal lesions, neonatal brain infections, meningitis and wound infections,
E. vulneris – Most isolates of this species have been isolated from wounds,

E. senegalensis – no known pathogenic role has been identified.

Escherichia coli

Of the species found in this genus, E. coli represents the overwhelming majority of isolates from pathogenic and nonpathogenic sources.

Some distinctive features of E. coli are as follows:

- Vast majority ferment lactose with the production of acid and gas. This is a distinct feature used in the preliminary identification of isolates.
- Most strains are motile by means of peritrichous flagella.
- The cell wall structure of E. coli is typically that associated with gram-negative enteric rods and contains lipopolysaccharide (LPS).
- There are approximately 170 “O” (somatic) antigens that have been characterized thus far. Three of these antigen cross-react with Salmonella, Shigella and Klebsiella.
- Strains that are motile possess H (flagella) antigens that can be used for epidemiological purposes.

The fermentation of lactose on Endo agar results in a distinctive red color due to the indicator present in the medium. Courtesy of CDC.

For the most part, E. coli are considered common bacteria that colonize the human colon. Occasionally, they can be opportunistic pathogens with urinary tract infections being the most common. They can also be potent pathogens capable of causing serious diarrheal diseases.

Epidemiology of E. coli Infections

In as much as E. coli has a very close association with humans via the gastrointestinal tract, many infections are the result of this association.

Infections can be caused by spread from the individual’s own intestinal tract to other parts of the body (such as is often the case with urinary tract infections). In the case of strains of E. coli that are associated with diarrhea (often in epidemic forms), transmission occurs usually via the ingestion of contaminated water or food.
Diseases Associated with *E. coli*

**Urinary Tract Infections**

UTIs caused by *E. coli* are by far the most common type of infection associated with this organism. Among both females and males, the percentage of UTIs associated with *E. coli* is approximately 70 to 80%. Most infections are "endogenous", that is, they are caused by the individual’s (or the individual’s partner’s) own intestinal strains of *E. coli*.

Most infections are reasonably easy to treat with common antimicrobials such as sulfamethoxazole/trimethoprim (Bacterim®) and nitrofurantoin (Macrobid®). In healthy individuals with no kidney problems, complications are rare.

**Wound and Soft Tissue Infection**

In debilitated and incontinent patients, it is not unusual to isolate *E. coli* from these sources. Often, however, it is found in association with other pathogens such as *S. aureus*. In many of these instances, the *E. coli* isolated may often be a commensal or an opportunist.

**Meningitis**

Most cases of *E. coli* meningitis occur in newborn infants and in the elderly. It can also occur in persons who are immunosuppressed or immunocompromised including persons undergoing organ or bone marrow transplantation.

Most cases of meningitis in newborns occur during delivery, resulting from microorganisms normally present in the birth canal. Premature and low-weight newborns are at a much higher risk.

This is a very serious disease. Approximately 20% of infected infants die and many of those who survive have permanent brain damage.

Despite a great deal of research, no effective vaccine has yet to be developed.

**Diarrheal Diseases**

There are six major classifications of *E. coli* that are capable of causing diarrheal diseases. These are described in the table at the top of the next page. The first four are included in most references whereas the last two are not always included.

Collectively, these are referred to as “diarrheagenic” *E. coli*.

Enhanced electron micrograph showing fimbrae on *E. coli* Courtesy of Midlands Technical College

There is still confusion as to whether or not cranberries in a variety of forms, including dried berries, cranberry juice with at least 20% real juice and/or cranberry tablets will aid in resolving these infections. Many publications say they will help and almost an equal number say they won’t. It appears that cranberries (along with several other berries such blueberries and loganberries from Europe) contain substances referred to as pycocyanins which appear to interfere with the attachment of the bacterial cells to the uroepithelial cells lining the bladder. This suggests that there might be a genetic component that involves the fimbrae (small hair-like appendages that appear to have a role in the attachment to specific cell receptors on these cells).

The percentage of UTIs caused by *E. coli* takes a precipitous drop in nursing home patients where it may be as low as 30%. In these settings, other more antimicrobial resistant organisms appear to replace it. These include a wide variety of other organisms such as *Proteus rettgeri*, *Morganella morganii*, *Enterococcus* sp. (including VRE), *Staphylococcus aureus* and *epidermidis* and *Pseudomonas* sp.

The “BRAT” diet for diarrhea – bananas, apples, rice and toast Courtesy of USDA
Hemolytic Uremic Syndrome

Hemolytic uremic syndrome (HUS) usually follows cases of infections by Shiga toxin-producing *E. coli* O157:H7. Most cases occur in children. This syndrome is considered a medical emergency and 5 to 10% of the children with it will die. The only treatment for it is renal dialysis. With proper treatment, most recover without any consequences but a small number will develop chronic renal disease and will become dependent on dialysis.

Treatment of infections caused by *E. coli* O157:H7 with antibiotics is controversial since it sometimes stimulates further production of the Shiga toxin thereby increasing the risk of HUS. There is some evidence, however, that some antibiotics such as the quinolones may decrease the risk.

Eculizumab, a monoclonal antibody, has been used successfully to treat HUS.
Laboratory Tests

*E. coli*, fortunately, grows very well in most all conventional and enrichment media. Plain, traditional nutrient agar and blood agar support excellent growth. There are a number of selective and different media, such as eosin methylene blue agar (EMB) and Endo agar that are excellent for isolating and initially identifying *E. coli*. Usually, the laboratory can isolate, identify and perform antimicrobial susceptibility testing within 48 hours of receipt of the specimen.

**Shiga toxigenic *E. coli* (STEC)**

It is important to identify strains of *E. coli* that produce Shiga toxin as quickly as possible because of the association of these organisms with HUS. There is one commercial assay presently available for detecting the presence of Shiga toxin in stools as well as in broth cultures. The tests, however, have a number of limitations.

Testing Available from Quest Diagnostics

**Shiga Toxin, EIA with Reflex to *E. coli* O157 Culture**

If the Shiga toxin by EIA is detected, *E. coli* O157 culture will be performed at an additional charge. In the case of non-frozen specimens, broth amplified immunoassay is performed. In the case of frozen specimens, direct detection with amplification is performed.

Limitations: False-positive findings can occur in patients infected with *Pseudomonas aeruginosa*.

Clinical significance: This test detects shiga toxins produced by enterohemorrhagic *E. coli* and other enteric organisms which have been isolated from patients who have hemorrhagic colitis with or without hemolytic-uremic syndrome. Culture allows CDC to tract outbreaks by strain typing.

**E. coli, Pathogenicity Study for Diarrhea**

This is a panel which includes studies for Enteroinvasive *E. coli*, Enteropathogenic *E. coli*, Verotoxigenic *E. coli* and enterotoxigenic (it) *E. coli*. See individual assays for further descriptions.

Infection control Practices

*E. coli* is ubiquitous in all stool specimens and is therefore, one of the most common organisms in our environment. The vast majority of strains that we will encounter will be nonpathogenic and basically harmless. Occasionally, diarrheagenic strains will enter the food chain and may cause significant food outbreaks. As is the case with those *E. coli* that produce Shiga toxins, ingestion of contaminated food products can lead to serious infections including death in the case of children. Below are several ways that you can reduce the possibility of *E. coli*-associated infections (and other intestinal infections for that matter):

- **Wash your hands thoroughly** – wash with warm soapy water for at least 20 seconds. Also wash your forearms. Good, effective handwashing is one of the most important steps in avoiding foodborne disease. It should be performed using a liquid soap and warm water. The forearms should be bare so that they can also be washed thoroughly,

- **Cook food thoroughly**. Ensure that ground beef, other meats and eggs are well cooked before serving. It is wise to use a food thermometer for meats and to make sure they are cooked to 160°F. Sunnyside eggs, soft-boiled eggs and poached eggs can be dangerous and should not be consumed. Cake batter prepared with raw eggs should not be eaten until after it has been cooked, *i.e.* no licking of bowls. See table on the next page for cooking temperatures,
- Wash raw vegetables and fruits before consuming. Use soapy water if you really want to wash them thoroughly. Don’t forget to rinse thoroughly also. This is particularly true for leafy vegetables (lettuce, spinach, etc.). A recent report from CDC indicated that Norovirus infections were often implicated with leafy vegetables that hadn’t been washed.
- Use separate cutting boards for different tasks. Do not use the cutting board that you just used for meat or chicken to cut vegetables. Wash cutting boards with hot soapy water before using them again. They can be disinfected using one tablespoon of household bleach to one gallon of water.
- This solution must be made fresh each day. When cutting boards become excessively worn or develop hard-to-clean grooves, consider replacing them. Ceramic and glass cutting boards are definitely preferred over wooden ones.

Safe Minimum Internal Temperatures and Cooking Guidelines

<table>
<thead>
<tr>
<th>Food Product(s)</th>
<th>° F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td>Cook until yoke and white are firm (no sunny side eggs or soft boiled ones)</td>
</tr>
<tr>
<td>Egg dishes and sauces</td>
<td>160°</td>
</tr>
<tr>
<td>Ground turkey, chicken</td>
<td>165°</td>
</tr>
<tr>
<td>Ground beef, veal, lamb, pork</td>
<td>160°</td>
</tr>
<tr>
<td>Steaks, roasts, chops</td>
<td>145° with a 3-minute rest time before removing from heat source</td>
</tr>
<tr>
<td>Ham, fresh (raw)</td>
<td>145° with a 3-minute rest time</td>
</tr>
<tr>
<td>Fully cooked (to reheat)</td>
<td>140°</td>
</tr>
<tr>
<td>Poultry (all products)</td>
<td>165°</td>
</tr>
<tr>
<td>Stuffing (cooked alone or in bird)</td>
<td>165°</td>
</tr>
<tr>
<td>Sauces, soups, gravies, marinades</td>
<td>Bring to a boil – for at least 2 minutes</td>
</tr>
<tr>
<td>Fish with fins</td>
<td>Cook until opaque and flakes easily with fork</td>
</tr>
<tr>
<td>Shrimp, lobster crab</td>
<td>Shell should turn red and flesh should become opaque</td>
</tr>
<tr>
<td>Clams, mussels, oysters</td>
<td>Cook until shells open</td>
</tr>
</tbody>
</table>

Courtesy of the U.S. Dept. of Agriculture
Special Infection Control Practices regarding Urinary Tract Infections

There are a number of steps one can take to reduce the possibility of urinary tract infections. These include:

- Drink at least six eight-ounce glasses of water daily (e.g., keep well hydrated especially in hot weather),
- Practice good personal hygiene after using the toilet,
- Practice good personal hygiene before and after sexual activity,
- Avoid the use of feminine hygiene products that “smell good”. Often the aromatic oils in these products can irritate the urethra thus setting the person up for an infection,
- Avoid communal jacuzzis and hot tubs. They are a great place for *E. coli* and other intestinal bacteria to grow very rapidly.

This material was taken from the U.S. Department of Agriculture’s booklet entitled *Cooking for Groups: A Volunteer’s Guide to Food Safety*. This entire booklet can be accessed from their site by clicking here.

Recommended References


Centers for Disease Control and Prevention. 2012. General information: *E. coli* (*Escherichia coli*). Click here to access website.

Centers for Disease Control and Prevention. 2010. Shiga toxin-producing *Escherichia coli* infections: what clinician need to know. Click here to access website. This site also provides free CMEs/CEUs.

Mayo Clinic. 2012. *E. coli*. Click here to access website.


Free CME/CEU Credits Available Here

Assessing and Improving Health Outcomes in Patients with Invasive Fungal Infections – Click here to access free CME/CEU offering.

Rotavirus vaccine: protection for the family. Click here to access free CME/CEU offering.

CDC advises on meningitis vax for babies. Click here to access free CME/CEU offering.

Viral hepatitis review. Click here to access free CME/CEU offering.

Chlorhexidine baths in PICU cut infections. Click here to access free CME/CEU offering.
Other Infectious Disease News

What is The Best Way to Screen for MRSA?
Researchers recently evaluated nasal swabs against swabs from a number of body sites to determine how effective nasal swabbing is for MRSA screening.

The gold standard was determined to be the sum of all the positive cultures from nasal, throat, axillary and perineal screening. The best was nasal screening which yielded 60%. Nasal and perineal screening was the best combination with 82% of all the positives. Axillary screening was the worst.


Protecting The Whole Family against Rotavirus
In a study conducted at Northwestern Hospital in Chicago, IL, it was found that since the introduction of RotaTeq®, a pediatric vaccine against Rotavirus, the number of adults infected with the vaccine dropped from 4.3 % to 2.2 % - almost a 50 % drop.

About 30 % of adults positive by Rotavirus culture were immunocompromised and that number didn't change from 2006 when the vaccine was introduced.

Anderson, E.J. et al. 2013. Indirect protection of adults from rotavirus by pediatric rotavirus immunization. Clinical Infectious Diseases First published online. Click here to access abstract.

Using Chlorhexidine baths in the Pediatric ICU reduces Infections
According to a recent report from Johns Hopkins University, Baltimore, MD, daily scrubbing of infants in pediatric ICUs resulted in a decrease in bacteremias from 4.93 to 3.28 infections per 1,000 patient-days. That was a reduction of more than 38 %.


When are Resuscitation Bags “Dirty”?
The Centers for Disease Control and Prevention recommendation for changing manual resuscitation bags is simply to “change them when they appear dirty”.

A recent study carried out by the University of Tennessee Medical Center, Knoxville, TN strongly suggests that this is not a very effective criterion. The study involved swabbing the inner hub of the connector site and studying the bacterial load. The results showed that according to the bacterial load, the bags should be changed every four days regardless of how they looked.


Pertussis-like Illness: Maybe more than One Microorganism
In a study of 918 cases of pertussis-like illness in Franklin County, Ohio, investigators found that Bordetella pertussis wasn’t the only species of Bordetella present.

Antibodies from five of ten patients and nasopharyngeal swabbings from 164 of 298 patients indicated the presence of another species – Bordetella holmesii. This was the first documented mixed outbreak of B. pertussis and B. holmesii infections. B. holmesii particularly affected adolescents.

Previously, B. holmesii was thought to be associated primarily with septicemias and not with respiratory illnesses.


Disinfecting Hospital Rooms using Hydrogen Peroxide Vapor
It is a well-known fact that the admission to a hospital room previously occupied by a patient infected with certain multidrug-resistant organisms (MDROs) increases the risk of acquiring these organisms. Traditional cleaning regimens do not completely eliminate the risk of acquiring all these MDROs.

Investigators at Johns Hopkins University School of Medicine found that the use of hydrogen peroxide vapor significantly reduced the risk to some of the MDROs but not all. For example, there was no significant reduction in risk for Clostridium difficile, methicillin-resistant Staphylococcus aureus and multidrug-resistant gram-negative rods.

**New Test for Lyme Disease causes Uproar**
The present test, approved by the Centers for Disease Control and Prevention, is a two-tiered test that is totally dependent of serological testing. IgM and IgG antibody titers are determined by EIA and positive tests are followed up by Western blot. This test only indicates past exposure as evidenced by the presence of antibodies. It does not address present infection. The development of a test that utilizes culture has not been possible due to the inordinate length of time required to get a positive result as well as inherent problems in culturing *Borrelia burgdorferi*.

In 2011, Advanced Laboratory Services in Pennsylvania announced a new culture test for *B. burgdorferi*. If this test works as advertised, it would be a wonderful breakthrough. There are just a few problems though including the following:

- It has never been approved by FDA. However, this approval is not required when the same company manufactures the test kit and then performs it,
- It has never been validated,
- It has never been peer-reviewed or published,
- It has never been evaluated by Lyme disease experts.

And then there is this one last really big problem. It appears that none (or very few) of the insurance companies are going to reimburse for the test at this time. That definitely is a problem with a test that costs $ 595.

The information concerning this test appeared in Medscape, 30 January 2013.

**How Many People got infected during the 2009 H1N1 Pandemic**
Pandemics and epidemics are far more accurately evaluated when examined several years later when all of the dust has settled.

The data suggest that at least 20 % of all persons were infected with the H1N1 virus during the first year of the pandemic. In the case of children, (46 %) between the ages of 5 and 19 were infected during the same time period. These conclusions were drawn from the serological examination of 90,000 specimens from 19 countries including the U.S., China, Canada, United Kingdom and Australia.


**New Test Offerings from Quest Diagnostics**

**Please Note**
Only those new tests being offered by Quest Diagnostics that involve infectious diseases are listed here

**Parainfluenza Virus (type 1 to 4) RNA, qualitative, Real-Time, PCR**

**Message**
This test is **not** available for NY patient testing.

**Clinical Significance**
Human parainfluenza virus (types 1, 2, 3 and 4) are important pathogens and are major causes of upper and lower respiratory tract diseases. A multiple real-time PCR assay offers the advantages of increased specificity and sensitivity, identification of HPIV type in a single reaction and rapid availability of results. All of these factors will assist the clinician in the diagnosis of respiratory disease, decrease inappropriate use of antibiotics, as well as reduce time of hospitalization and help prevent nosocomial infections.

**Specimen Requirements**
The preferred specimen is a throat or nasopharyngeal swab in 3 mL of M4 medium or VCM medium (green-cap) tube or equivalent.

Acceptable specimen sources include sputum, bronchial lavage/wash, nasopharyngeal aspirate/wash or tracheal lavage/wash collected in a sterile leakproof container.

**Transport Temperature**
Refrigerated

**Specimen Stability**
Room temperature: 48 hours
Refrigerated: 7 days
Frozen: 30 days

**Set-up/Analytic Time**
Setup: daily
Report available: 1 to 3 days
Reference Range
Not detected

Performance
This test was developed and its performance characteristics have been determined by Focus Diagnostics. Performance characteristics refer to the analytical performance of the test. This test is performed pursuant to a license agreement with Roche Molecular Systems, Inc.

Methodology
See individual tests

Performing Site
Focus Diagnostics

Respiratory Virus PCR Panel I

Message
This test is not available for NY patient testing.

Clinical Significance
This test is used to determine the presence of respiratory virus RNA/DNA in a patient specimen. PCR provides more rapid results than other methods including culture. The use of a panel for virus detection provides a useful differential diagnosis.

Specimen Requirements
The preferred specimen is a throat or nasopharyngeal swab in 3 mL of M4 medium or VCM medium (green-cap) tube or equivalent.

Acceptable specimen sources include sputum, bronchial lavage/wash, nasopharyngeal aspirate/wash or tracheal lavage/wash collected in a sterile leakproof container.

Transport Temperature
Refrigerated

Specimen Stability
Room temperature: 48 hours
Refrigerated: 7 days
Frozen: 30 days

Set-up/Analytic Time
Setup: daily
Report available: 1 to 3 days

Reference Range
Not detected

Performace
This test was developed and its performance characteristics have been determined by Focus Diagnostics. Performance characteristics refer to the analytical performance of the test. This test is performed pursuant to a license agreement with Roche Molecular Systems, Inc.

Methodology
See individual tests

Performing Site
Focus Diagnostics

Respiratory Virus PCR Panel IV

Message
This test is not available for NY patient testing.

Specimen Requirements
The preferred specimen is a throat or nasopharyngeal swab in 3 mL of M4 medium or VCM medium (green-cap) tube or equivalent.

Acceptable specimen sources include sputum, bronchial lavage/wash, nasopharyngeal aspirate/wash or tracheal lavage/wash collected in a sterile leakproof container.

Transport Temperature
Refrigerated

Specimen Stability
Room temperature: 48 hours
Refrigerated: 7 days
Frozen: 30 days

Set-up/Analytic Time
Setup: daily
Report available: 1 to 3 days

Methodology
See individual tests

Performing Site
Focus Diagnostics

Respiratory Virus PCR Panel with 2009 H1N1

Message
This test is not available for NY patient testing.

Specimen Requirements
The preferred specimen is a throat or nasopharyngeal swab in 3 mL of M4 medium or VCM medium (green-cap) tube or equivalent.

Acceptable specimen sources include nasopharyngeal aspirate collected in a sterile leakproof container.

Transport Temperature
Refrigerated
**Specimen Stability**
- Room temperature: 48 hours
- Refrigerated: 7 days
- Frozen: 30 days

**Set-up/Analytic Time**
- Setup: daily
- Report available: 1 to 3 days

**Methodology**
See individual tests

**Performing Site**
Focus Diagnostics

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**Tetanus Antitoxoid, Pre and Post Vaccination**

**Specimen Requirements**
1 mL (0.25 mL minimum) serum x 2

**Rejection Criteria**
PRE and POST sample must be received. Samples must be dated and labeled PRE and POST. Gross hemolysis, gross lipemia and grossly icteric are grounds for rejection.

**Transport Temperature**
Refrigerated

**Specimen Stability**
- Room temperature: 7 days
- Refrigerated: 14 days
- Frozen: 30 days

**Set-up/Analytic Time**
- Set-up: Monday, Wednesday, Fridays
- Report available: 1 – 4 days

**Reference Range**
- Tetanus Antitoxoid Pre: no reference range available
- Tetanus Antitoxoid Post: < 0.05 IU/mL

**Interpretive Criteria**
- < 0.05 IU/mL Nonprotective antibody level
- 0.05 – 0.49 IU/mL indeterminate for protective antibody.

A minimal four-fold increase between pre-immunization and post-immunization sera is considered a normal response to tetanus toxoid. Levels greater than or equal to 0.50 IU/mL are generally considered protective, whereas levels less than 0.05 IU/mL indicate a lack of protective antibody. Levels between 0.05 and 0.49 IU/mL are indeterminate for the presence of protective antibody and may indicate a need for further immunization to tetanus toxoid.

This test was developed and its performance characteristics have been determined by Focus Diagnostics. Performance characteristics refer to the analytical performance of the test.

**Methodology**
Immunoassay

**Performing Site**
Focus Diagnostics

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A WAY OF LIFE
THE NEW ENGLAND COVERED BRIDGE
If you’ve never heard the clip-clop of a horse and wagon as it passes through a covered bridge, then you have missed a unique moment in life.

The State of Vermont and several other states are dotted with covered bridges. They are also found in New Hampshire, Maine and Massachusetts on a pretty regular basis. Even Connecticut has a couple of them.

These unique bridges were designed and built for one reason. When a team of horses passed over a bridge without a cover, it was very easy for the horses to panic, bolt and end up in the river. As long as they couldn’t see the river (especially at high water), they usually stayed quiet and passed over it without much of a problem.

During the winter, it was necessary for the townsmen to shovel snow onto the bridge surface so that the runners of the sleighs would pass smoothly through. Steel or iron runners don’t pass over dry wood very well.

The bridge at West Dummerston was built in 1872 and is the second longest bridge within the state. It crosses the West River and is a very popular site for tourists. It was built as two separate sections totaling 271 feet long.

In 1942, the bridge underwent extensive repairs to both the structure and the deck. This was necessary to strengthen the bridge for today’s heavier traffic.

The original bridge was built by Caleb Lamson and is the only example of his work to survive. Incidentally, there is good fly fishing above and below this bridge.
Brown's River Covered Bridge
Vermont's Oldest Covered Bridge

This appears to be the oldest covered bridge in Vermont having been built in 1839. In the 1960's a concrete bridge was built alongside. Several later attempts were made to rehabilitate the bridge but at present it is closed to motor traffic.

There is very good fly fishing for trout above and below this bridge.

This bridge is one of the newer ones in Vermont having been built in 1904. Known as the Braley Bridge, it is located in Randolph, Vermont.