

Hemolytic Uremic Syndrome, post-diarrheal

BASIC EPIDEMIOLOGY

Infectious Agent

Hemolytic uremic syndrome (HUS) is a rare, but serious disease that affects the kidneys and interrupts blood coagulation. The most common form is HUS post-diarrheal, which occurs after an infection with Shiga toxin-producing *E. coli* (STEC), specifically *E. coli* O157. Among children younger than 18 years old who develop HUS, 80% have a STEC infection. HUS is less common in persons with non-*E. coli* O157 infections. Other bacteria and viruses have been reported in association with HUS, but correlation to HUS in these cases is unknown. In Asia and Africa, *Shigella dysenteriae* has been associated to HUS.

Transmission

HUS is a clinical syndrome and is not transmissible from person to person.

Incubation Period

HUS develops one to three weeks after the initial infection.

Communicability

HUS is a clinical syndrome and does not have a period of communicability. If HUS occurs after an infection, such as STEC, the infectious agent that caused the initial infection will have a period of communicability.

Clinical Illness

Most cases of post-diarrheal HUS occur following an infection with STEC. In cases of infection, damage occurs to the red blood cells surface features, therefore clogging normal filtration by the kidneys, causing acute kidney failure. Patients may develop anemia, low platelet counts, elevated creatinine levels, blood in the urine, protein in the urine, and evidence of red blood cell destruction.

Severity

HUS is self-limited in most cases with 50-70% of patients requiring short term dialysis. Up to 25% of patients do develop chronic renal failure and hypertension, which requires long term treatment. Between 3-5% of cases with HUS die.

DEFINITIONS

Clinical Case Definition

Hemolytic uremic syndrome (HUS) is characterized by the acute onset of microangiopathic hemolytic anemia, renal injury, and low platelet count. Thrombotic thrombocytopenic purpura (TTP) also is characterized by these features but can include central nervous system (CNS) involvement and fever and can have a more gradual onset. Most cases of HUS (but few cases of TTP) occur after an acute gastrointestinal illness (usually diarrheal).

Laboratory Confirmation

The following are both present at some time during the illness:

- Anemia (acute onset) with microangiopathic changes (i.e., schistocytes, burr cells, or helmet cells) on peripheral blood smear, **AND**
- Renal injury (acute onset) evidenced by either hematuria, proteinuria, or elevated creatinine level (i.e., greater than or equal to 1.0 mg/dL in a child aged less than 13 years or greater than or equal to 1.5 mg/dL in a person aged greater than or equal to

13 years, or greater than or equal to 50% increase over baseline)

Note: A low platelet count can usually, but not always, be detected early in the illness, but it may then become normal or even high. If a platelet count obtained within 7 days after onset of the acute gastrointestinal illness is not less than 150,000/mm³, other diagnoses should be considered.

Case Classifications

Confirmed: An acute illness diagnosed as HUS or TTP that both meets the laboratory criteria and began within 3 weeks after onset of an episode of acute or bloody diarrhea

Probable:

- An acute illness diagnosed as HUS or TTP that meets the laboratory criteria in a patient who does not have a clear history of acute or bloody diarrhea in preceding 3 weeks

OR

- An acute illness diagnosed as HUS or TTP that a) has onset within 3 weeks after onset of an acute or bloody diarrhea and b) meets the laboratory criteria except that microangiopathic changes are not confirmed

Notes: See [Shiga toxin-producing *Escherichia coli* \(STEC\)](#). Cases meeting the criteria for both conditions should be reported separately under each condition.

SURVEILLANCE AND CASE INVESTIGATION

Case Investigation

Local and regional health departments should promptly investigate all reports of Hemolytic Uremic Syndrome (HUS). Investigations should include an interview of the case or a surrogate to get a detailed exposure history. Please use the Shiga Toxin-Producing *Escherichia coli* (*E. coli*) and/or Hemolytic Uremic Syndrome (HUS) Investigation Form available on the DSHS website: <http://www.dshs.state.tx.us/idcu/investigation/>.

Case Investigation Checklist

- Confirm laboratory results meet the case definition.
- Verify that the laboratory has forwarded an isolate or specimen in the case there was a recent laboratory confirmed diarrheal illness before the development of HUS to the DSHS laboratory. If an isolate has not been sent, please request a specimen be submitted as required.
- Review medical records or speak to an infection preventionist or healthcare provider to verify case definition, identify possible risk factors and describe course of illness.
- Interview the case to get a detailed exposure history and risk factor information.
 - Use the **Shiga Toxin-Producing *Escherichia coli* (*E. coli*) and/or Hemolytic Uremic Syndrome (HUS) Investigation Form** to record information from the interview.
 - If the case is not available or is a child, conduct the interview with a surrogate who would have the most reliable information on the case, such as a parent or guardian.
 - Provide education to the case or his/her surrogate about effective hand washing, food safety practices, and animal contact/handling precautions. See Prevention and Control Measures.
- Fax completed forms to DSHS EAIDU at **512-776-7616** or email securely to FoodborneTexas@dshs.texas.gov.
 - For lost to follow-up (LTF) cases, please complete as much information obtained from medical/laboratory records (e.g., demographics, symptomology, onset date, etc.) on investigation form and fax/email securely to DSHS EAIDU,

- noting case is LTF.
- For HUS cases, please also submit the medical record along with the completed form
- Identify whether the case needs to be excluded based on ongoing illness and either the occupation or attendance in a group setting. Examples include food handlers, child-care or health-care workers, or attend child-care as long as they have diarrhea. See Exclusions.
- If case is part of an outbreak or cluster, see Managing Special Situations section.
- All confirmed and probable case investigations must be entered and submitted for notification in the NEDSS Base System (NBS). Suspect cases are not included in the overall case counts but are included for programmatic review. Please refer to the *NBS Data Entry Guidelines* for disease specific entry rules.

Prevention and Control Measures

- Routine hand washing with soap and warm water, especially:
 - Before preparing, handling or eating any food.
 - After going to the bathroom.
 - After changing a diaper.
 - After caring for someone with diarrhea.
 - After handling raw food, especially poultry and beef.
 - After any contact with animals, their living areas or their food.
- Avoid consuming raw milk, unpasteurized dairy products, and unpasteurized juices (like fresh apple cider).

Follow food safety principles in the kitchen, especially:

- Restrict any food preparation for other individuals until symptoms have resolved
- Cook ground beef thoroughly. Ground beef and meat that has been needle-tenderized should be cooked to a temperature of at least 160°F (70°C). Use a thermometer to verify the temperature, as color is not a very reliable indicator of how thoroughly meat has been cooked.
- Prevent cross-contamination in food preparation areas by thoroughly washing hands, counters, cutting boards, and utensils after handling raw meat and switching to items consuming raw such as vegetables
- Wash fresh leafy greens, fruits and vegetables thoroughly with water.
- Avoid swallowing water when swimming and playing in lakes, ponds, streams, swimming pools, and backyard "kiddie" pools.
- Avoid participating in recreational water activities such as swimming while diarrhea is present and for two weeks after diarrhea has resolved.

Exclusions

There are no specific exclusions for HUS, however it is important to evaluate if the case has an ongoing diarrheal illness that would require exclusions for that specific condition. Please follow the exclusion criteria listed in other disease-specific chapters of this document if the case has a laboratory-confirmed diarrheal illness (such as Shiga toxin-producing *E. coli*).

MANAGING SPECIAL SITUATIONS

Outbreaks

If an outbreak is suspected, notify the DSHS Emerging and Acute Infectious Disease Unit (EAIDU) at **(512) 776-7676** or email an EAIDU foodborne epidemiologist at FoodborneTexas@dshs.texas.gov.

The local/regional health department should:

- Determine if there is a common, laboratory-confirmed etiology between the HUS cases

- Interview all cases suspected as being part of the outbreak or cluster.
- Request medical records for any case in your jurisdiction that died, is lost to follow-up, was too ill to be interviewed, or for whom there are no appropriate surrogates to interview.
- Prepare a line list of cases in your jurisdiction. Minimal information needed for the line list might include patient name or other identifier, DSHS or laboratory specimen identification number, specimen source, date of specimen collection, date of birth, county of residence, date of onset (if known), symptoms, underlying conditions, treatments and outcome of case, and risky foods eaten, foods eaten leading up to illness, or other risky exposures, such as animal contact and travel, reported by the case or surrogate.

Line list example:

ID	Name	Age	Sex	Ethnicity	Onset	Symptoms	Food	Animal	Notes
1	NT	34	F	W/N	2/4/16	Bl. D, F	Chicken, eggs	Dog	Dog food
2	PR	2	M	U/U	1/30/16	V,D,F	Chicken, spinach	None	Brother ill

- If the outbreak was reported in association with an apparent common local event (e.g., party, conference, rodeo), a restaurant/caterer/home, or other possible local exposure (e.g., pet store, camp), contact hospitals in your jurisdiction to alert them to the possibility of additional HUS cases.
 - Review other laboratory-confirmed cases to determine if others might have attended the event as well
- If isolates have not already been submitted to the DSHS laboratory for confirmation and whole genome sequencing, request hospital/clinical labs submit isolates for confirmation and whole genome sequencing. See Laboratory Procedures.
- Work with any implicated facilities to ensure staff, students, residents, and volunteers receive hand hygiene education, and review hygiene and sanitary practices currently in place including:
 - Policies on, and adherence to, hand hygiene
 - Storage and preparation of food
 - Procedures for changing diapers and toilet training
 - Procedures for environmental cleaning
- Recommend that anyone displaying symptoms seeks medical attention from a healthcare provider.
- Exclude individuals from handling food, engaging in child-care, healthcare work, or attending child-care, if they are symptomatic. See Exclusions in Case Investigation section.
- Enter outbreak into NORS at the conclusion of the outbreak investigation. See Reporting and Data Entry Requirements section.

REPORTING AND DATA ENTRY REQUIREMENTS

Provider, School, Child-Care Facility, and General Public Reporting Requirements

Confirmed and probable cases are required to be reported **within 1 week** to the local or regional health department or DSHS EAIDU at **(512) 776-7676**.

Local and Regional Reporting and Follow-up Responsibilities

Local and regional health departments should:

- Enter the case into NBS and submit an NBS notification on all **confirmed and probable** cases.
 - Please refer to the *NBS Data Entry Guidelines* for disease-specific entry rules.
 - Fax completed investigation forms and medical records to DSHS EAIDU at **512-776-7616** or email securely to FoodborneTexas@dshs.texas.gov.

When an outbreak is being investigated, local and regional health departments should:

- Report outbreaks within 24 hours of identification to the regional DSHS office or to EAIDU at **512-776-7676**.
- Enter outbreak information into the **National Outbreak Reporting System (NORS)** at the conclusion of the outbreak investigation.
 - For NORS reporting, the definition of an outbreak is two or more cases from separate households of similar illness associated with a common exposure.
 - The following should be reported to NORS:
 - Foodborne disease, waterborne disease, and enteric illness outbreaks with person-to-person, animal contact, environmental contact, or an indeterminate route of transmission.
 - Enter outbreaks into NORS online reporting system at <https://wwwn.cdc.gov/nors/login.aspx>
 - Forms, training materials, and other resources are available at <http://www.cdc.gov/nors/>
- To request a NORS account, please email FoodborneTexas@dshs.texas.gov
 - Please put in Subject Line: NORS User Account Request
 - Information needed from requestor: name, email address, and agency name
 - After an account has been created, a reply email will be sent with a username, password, and instructions for logging in.

LABORATORY PROCEDURES

There is no confirmatory testing provided at the DSHS Laboratory for HUS, however in the case there was a recent laboratory confirmed diarrheal illness before the development of HUS, the isolate or specimen must be submitted to the DSHS Laboratory.

In the event there is an increase in HUS cases or/and an outbreak of HUS with a recent history of diarrheal illness but no laboratory confirmation, please consult with an EAIDU foodborne epidemiologist about additional stool testing.

REVISION HISTORY

December 2021

- Minor edits

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- Entire Section