CONDITION

Hemolytic-uremic syndrome

Hemolytic-uremic syndrome is a serious condition in which red blood cell damage and low platelets can cause sudden kidney injury.

WHAT IT IS
Red-cell destruction and low platelets causing sudden kidney injury

BODY SYSTEM
Blood and kidneys

MAIN SYMPTOMS
Diarrhea, unusual tiredness, bruising, reduced urination

WHAT CAUSES IT
Shiga toxin infection, complement overactivity, or other illnesses

HOW IT IS DIAGNOSED
Blood, urine, kidney-function, and stool tests

MAIN TREATMENT
Hospital supportive care; complement-blocking treatment for selected types

CAN IT BE CURED?
Sometimes - many infection-related cases recover

IS IT AN EMERGENCY?
Yes - suspected HUS needs urgent hospital assessment

LONG-TERM OUTLOOK
Many recover; some develop lasting kidney disease

Overview

Hemolytic-uremic syndrome, usually shortened to HUS, is a serious condition that affects the blood and kidneys. It causes three linked problems:

Platelets are blood cells that help stop bleeding. When red blood cells and platelets are damaged inside small blood vessels, the kidneys may not receive or filter blood normally. This can cause acute kidney injury, meaning kidney function worsens over hours or days.

The most common form follows an infection with certain strains of Escherichia coli , or E. coli . These bacteria make Shiga toxin, which can damage small blood vessels. This type is often called Shiga toxin-producing E. coli HUS, or STEC-HUS.

Other forms result from uncontrolled activity in part of the immune system called the

complement system. These are often called complement-mediated HUS or atypical HUS. HUS can also occur alongside certain infections, medicines, pregnancy complications, transplants, autoimmune conditions, or cancer.

HUS needs urgent hospital assessment. Early monitoring and supportive care help manage kidney injury, anemia, bleeding risk, blood pressure, and other complications.

- Red blood cells break apart earlier than they should
- The number of platelets falls
- The kidneys become injured

Symptoms

STEC-HUS often begins with a stomach and bowel infection. Early symptoms may include:

HUS usually develops several days after diarrhea begins, sometimes when the diarrhea seems to be improving. Signs of blood-cell damage, low platelets, or kidney injury can then appear.

These may include:

Severe HUS can affect the brain, heart, lungs, or digestive system. Confusion, seizures, extreme sleepiness, chest pain, breathing difficulty, or loss of consciousness require emergency care.

Not everyone with HUS has diarrhea. This is especially true of complement-mediated HUS and forms linked to other medical conditions.

- Abdominal pain or cramping
- Diarrhea, which may become bloody
- Vomiting
- Fever, although fever may be mild or absent
- Unusual tiredness, weakness, or irritability
- Pale skin
- Bruising or tiny red or purple skin spots
- Blood in the urine
- Urinating much less than usual
- Swelling around the eyes, feet, or ankles
- Nausea or poor appetite

- Headache or high blood pressure

Causes and risk factors

STEC-HUS is caused by Shiga toxin-producing bacteria. Infection may follow contact with contaminated food or water, farm animals, animal environments, or another infected person. Undercooked ground meat, unpasteurized products, contaminated produce, and untreated water are possible sources.

Only a minority of people with a Shiga toxin-producing infection develop HUS. Young children have a higher risk, but HUS can occur at any age. Older adults and people with certain health conditions may also have severe illness.

Complement-mediated HUS occurs when the complement system becomes overactive and damages the lining of small blood vessels. Complement normally helps defend the body from infection. In some people, inherited genetic changes or acquired immune proteins interfere with its control.

A genetic change does not always cause symptoms by itself. An infection, pregnancy, operation, or another physical stress may trigger an episode in someone who is susceptible. Genetic testing may not find a cause in every person with suspected complement-mediated HUS.

HUS-like illness can also occur with:

These causes are uncommon, but identifying them can change treatment.

- Certain other infections, including pneumococcal infection
- Pregnancy or the period after giving birth
- Organ or stem-cell transplantation
- Autoimmune conditions
- Severe high blood pressure
- Some cancers
- Certain medicines

Diagnosis

HUS is diagnosed from the pattern of blood-cell damage, a low platelet count, and kidney injury. No single symptom is enough to confirm it.

Blood tests usually include a complete blood count and tests of kidney function. A blood film may show fragments of damaged red blood cells called schistocytes. Other tests may show evidence that red blood cells are breaking down, including a raised lactate dehydrogenase level and a low haptoglobin level.

Urine tests check for blood, protein, and signs of reduced kidney function. Urine output, fluid balance, blood pressure, and blood salts such as potassium are monitored closely.

If diarrhea is present or recently occurred, a stool sample may be tested for Shiga toxin or the bacteria that produce it. Testing is most useful when done early, but a negative result does not always rule out an earlier infection.

Doctors may test the activity of an enzyme called ADAMTS13. Very low activity suggests thrombotic thrombocytopenic purpura, or TTP, a different blood-vessel condition that needs immediate treatment.

Complement blood tests, antibody tests, and genetic testing may help investigate complement-mediated HUS. Results can take time and may be normal even when this type is suspected. Treatment decisions may therefore be made before all results return.

Treatment and management

HUS is usually treated in hospital. Care depends on its cause, the severity of kidney injury, and whether other organs are affected.

Supportive treatment may include carefully managed fluids, correction of blood-salt problems, and treatment for high blood pressure. Red blood cell transfusions may be needed for significant anemia. Platelet transfusions are generally reserved for serious bleeding or certain procedures because low platelets alone do not always require transfusion.

Some people need dialysis. Dialysis temporarily performs part of the kidneys' filtering work by removing waste and extra fluid from the blood. It may be needed for very low urine output, dangerous potassium levels, fluid overload, or other complications. Needing dialysis during HUS does not always mean it will be permanent.

For suspected STEC infection, treatment mainly focuses on supportive care. Antibiotics and medicines that slow diarrhea are not routinely used for STEC-HUS because some may increase toxin exposure or complications. Decisions about antibiotics like amoxicillin or doxycycline depend on the organism and clinical situation.

Complement-mediated HUS may be treated with medicines that block complement activity, such as eculizumab or ravulizumab. These treatments can reduce further blood-vessel and kidney damage. Because complement-blocking medicines increase the risk of serious

meningococcal infection, vaccination and other infection precautions are required.

When HUS is linked to another condition or medicine, management includes addressing that trigger when possible. Plasma exchange is not routine treatment for STEC-HUS, but it may be started if TTP cannot initially be ruled out.

Complications

Acute kidney injury is the main complication. It can cause fluid buildup, high potassium, high blood pressure, or an abnormal acid level in the blood. Some people need dialysis.

Other possible complications include:

Kidney function often improves, particularly after infection-related HUS. However, some people later develop high blood pressure, protein in the urine, reduced kidney function, or chronic kidney disease. Rarely, kidney failure is permanent.

Complement-mediated HUS can return after recovery. It may also recur after a kidney transplant unless the complement problem is controlled.

- Severe anemia
- Bleeding related to low platelets
- Seizures, confusion, or stroke-like symptoms
- Inflammation or injury involving the heart
- Breathing problems from fluid buildup
- Injury to the bowel or pancreas

Prevention

Not every case of HUS can be prevented. Inherited susceptibility to complement-mediated HUS cannot currently be prevented, and some secondary forms occur unpredictably.

The risk of STEC infection can be reduced through food and hand hygiene:

People with diarrhea should follow local public health advice about returning to childcare, school, food handling, or healthcare work.

If complement-mediated HUS is linked to an inherited change, genetic counselling can explain what the result may mean for you and your relatives. It cannot guarantee whether or when someone will develop HUS.

- Cook ground meat thoroughly
- Avoid unpasteurized milk, juice, and dairy products
- Wash produce and keep raw meat separate from ready-to-eat food
- Wash hands after using the toilet, changing diapers, or touching farm animals
- Avoid swallowing water from pools, lakes, or streams
- Do not prepare food for others while you have diarrhea

Living with it and what to expect

Many people with STEC-HUS recover after hospital treatment, although recovery may take weeks or months. Tiredness and reduced stamina can continue after blood counts and kidney function begin improving.

Follow-up usually includes blood pressure checks, urine testing for protein, and blood tests to measure kidney function. These checks matter even if you feel well because high blood pressure or mild kidney damage may not cause symptoms.

Some people have lasting kidney problems. Follow-up may continue for years if there was severe kidney injury, dialysis, ongoing protein in the urine, or high blood pressure. Long-term treatment may include blood-pressure management and specialist kidney care.

Complement-mediated HUS often needs longer-term specialist monitoring. Treatment length is decided individually according to the trigger, genetic or antibody findings, kidney recovery, previous episodes, and risk of recurrence. Stopping complement-blocking treatment may require a plan for rapid testing if symptoms return.

Most people can gradually return to school, work, exercise, and everyday activities after recovery. The pace depends on energy levels, kidney function, blood pressure, and any effects on other organs.

When to get medical help

Seek urgent same-day medical care for bloody diarrhea, especially when it is accompanied by unusual tiredness, pale skin, bruising, swelling, or reduced urination. HUS can develop after the diarrhea starts to settle.

If you have previously had complement-mediated HUS, follow your specialist's plan for new vomiting, diarrhea, infection symptoms, dark urine, bruising, or reduced urine output.

Call emergency services for:

Routine follow-up is appropriate for blood pressure checks, kidney tests, medication monitoring, and discussion of genetic results when you otherwise feel stable.

- A seizure, fainting, severe confusion, or difficulty waking
- Trouble breathing or chest pain
- No urine or a major sudden reduction in urine
- Severe weakness, collapse, or uncontrolled bleeding
- Signs of a serious infection while receiving complement-blocking treatment, such as fever with severe headache, stiff neck, rash, or marked drowsiness

Common questions

Is hemolytic-uremic syndrome contagious?

HUS itself is not contagious. However, the bacteria that can lead to STEC-HUS can spread between people, especially through unwashed hands after using the toilet or changing diapers. Careful handwashing helps limit spread.

Does bloody diarrhea mean I have HUS?

No. Bloody diarrhea has several possible causes, and most people with diarrhea do not develop HUS. However, bloody diarrhea needs prompt medical advice. Reduced urination, pallor, bruising, swelling, or severe tiredness make urgent assessment especially important.

Can you fully recover from HUS?

Yes, many people with infection-related HUS recover, including recovery of kidney function. Some are left with high blood pressure, protein in the urine, or chronic kidney disease. Complement-mediated HUS has a greater risk of recurrence and may need long-term treatment.

Will I need dialysis forever?

Often not. Dialysis used during an acute HUS episode may only be needed while the kidneys recover. A smaller number of people develop permanent kidney failure and need long-term dialysis or a transplant.

Is atypical HUS the same as HUS?

Atypical HUS is an older term commonly used for HUS not caused by Shiga toxin. Many cases are now described more specifically as complement-mediated HUS. Other conditions can also cause a similar pattern, so careful testing is needed.

Can HUS happen again?

STEC-HUS is usually a single episode, although another Shiga toxin infection is possible. Complement-mediated HUS can recur, particularly during infections, pregnancy, surgery, or other physical stress. Your specialist may provide a monitoring plan for possible relapse.

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