

## Hepatic Encephalopathy

Hepatic Encephalopathy (HE) can occur as a result of either acute liver failure or chronic liver disease. The information provided below explains HE in adults and is intended to help the individuals who suffer from HE as well as their caregivers. It is important to note that children can also develop HE, but their symptoms are different compared to adults and therefore this information is not helpful for children with HE. Parents are advised to talk with a healthcare provider if they think their child may have HE.

### What is hepatic encephalopathy?

Hepatic Encephalopathy (HE) is a deterioration in brain function observed in people with acute liver failure or chronic liver disease. The brain is a very sensitive organ and relies on a healthy liver in order to properly function. HE can be grouped in three categories:

**Type A** is HE associated with Acute liver failure. Acute liver failure is a rapid deterioration (within days and weeks) of liver function in a person who had no pre-existing liver disease. Acute liver failure, also known as fulminant hepatic failure, can cause serious complications including excessive bleeding and elevated pressure in the brain which require emergency hospitalization.

**Type B** is HE associated with portal-systemic Bypass without liver disease. This occurs when blood flows “around” the liver and therefore the liver cannot control/remove substances in the blood. Type B usually occurs as a result of congenital abnormalities and/or as a result of an invasive procedures or trauma.

**Type C** is HE associated with Cirrhosis. Cirrhosis is a late stage of chronic liver disease when scarring (fibrosis) develops. Complications of cirrhosis may appear such as jaundice (a yellow discoloration of the skin and whites of the eyes), bruising and bleeding easily, fluid build-up in the abdomen (ascites) and painful swelling of the legs (edema), portal hypertension (an increase in the blood pressure within a system of veins called the portal venous system) and HE.

Symptoms and signs of HE vary from mild to severe. In the mild stage of HE, called minimal HE (MHE) or covert HE (CHE), a person’s ability to carry out daily tasks (working, driving, sleeping) is affected and as a result leads to poor quality of life. A person suffering from MHE may experience anxiety, problems concentrating, poor memory or be unable to think clearly. A person with severe HE or overt HE (OHE), experiences impaired mental and neuromotor functioning (tremor of the hand when wrist is extended called asterixis) with obvious signs of mental confusion, gross disorientation, drowsiness and coma.

## Unhealthy liver, unhealthy brain

The liver is an important organ which is responsible for a lot of essential tasks to life. Everything that is consumed passes down into the intestines where the food and drink are metabolized into various molecules which are passed into the blood stream and sent to the liver.

Not only does the liver filter out the “bad” from the “good” from what is sent from the intestines, it also plays an important role in producing blood clotting factors (proteins that help your blood clot) and helping to control glucose levels in the blood. When your liver is severely damaged, it can no longer remove these toxic molecules or produce the vital elements. In addition, the sick liver releases toxic molecules. A combination of all these factors (including an accumulation of toxins in the blood) affects the brain from properly functioning, causing HE.

## What is the cause of HE?

**Ammonia** is a molecule produced by bacteria within our intestine following digestion of food (primarily proteins). It is normally removed by the liver. However, when the liver is damaged, ammonia builds up in the blood which can easily enter the brain. At elevated concentrations, ammonia is toxic to the brain having a direct effect on the pH factor (acid/alkaline balance), metabolism and membrane potential (equilibrium of nerve cells). In turn, this leads to numerous alterations in the brain causing your nerve cells (neurons) not to function properly. Inflammation and oxidative stress are other factors which can be detrimental to the brain. These factors can be released into the blood stream as a result of the damaged liver or can be produced locally in the brain.

**Brain edema**, an accumulation of water which leads to swelling of the brain, is commonly associated with HE. In acute liver failure, brain edema contributes to an increase in pressure in the skull which can be fatal. In cirrhosis, even though an increase in pressure within the skull is not observed, brain edema is still present. An accumulation of water in the brain is primarily due to swelling of the astrocytes (a type of brain cell). Astrocytes work very closely with neurons to help maintain normal brain function. However, swollen astrocytes lead to dysfunction in neurons and therefore brain function is impaired.

The following triggers (precipitating factors) can cause or worsen HE:

- Infections
- Constipation
- Dehydration – this happens when you don’t get enough water and other fluids
- Bleeding inside your intestines, stomach or esophagus (the tube that connects your mouth to your stomach)
- Medications that affect your nervous system such as sleeping pills, antidepressants or tranquilizers
- Kidney problems
- Alcohol use
- Surgery

- Having a portosystemic shunt. This surgical procedure is called TIPS (trans intrahepatic portal-systemic shunt), and is done to reduce the pressure built up in the portal vein (the vein entering the liver from the intestines). The procedure involves placing a small tube through your liver to allow the blood to pass through your liver (like a tunnel through a mountain) and therefore reduce the portal hypertension and associated complications.

## Could I have it?

HE often starts slowly, and at first you may not be aware you have it. The stages of HE span from mild to severe and involve numerous symptoms. It is important for you and your family to become familiar with the signs and symptoms of HE so you can tell your doctor right away if you think you may have it. Prompt diagnosis is essential in order that your doctor can initiate the treatment of HE.

If you have been diagnosed with chronic liver disease, you could have HE if you are experiencing the following symptoms:

- Trouble sleeping at night
- Difficulty thinking clearly
- Poor concentration
- Often confused
- Anxiety
- Tend to forget things
- Mental foginess
- Slow reaction time
- Personality or mood changes
- Shortened attention span
- Poor judgment
- Worsening of handwriting or fine motor movements

These symptoms are difficult to diagnose but are often identified by a family member or caregiver.

### **More severe symptoms include:**

- Flapping tremor (tremor of the hand when the wrist is extended called asterixis) or abnormal movements
- Gross disorientation
- Drowsiness or severe confusion

- Strange behavior or severe personality changes
- Slurred speech
- Slowed or sluggish movement
- Coma: unconscious and unresponsive

If you are experiencing any of the symptoms listed above, please talk with your health care provider.

## How is hepatic encephalopathy diagnosed?

HE is diagnosed through symptoms. Some symptoms are evident (OHE) and some are not so obvious (CHE) which may require taking a neuropsychiatric test. This is why it is important to discuss HE with your healthcare provider. HE is graded from 0-4 and is divided into CHE and OHE. In the mild stage of HE, called minimal HE (MHE) or covert HE (CHE), a person's ability to carry out daily tasks (working, driving, sleeping) is affected and as a result leads to poor quality of life. A person suffering from MHE may experience anxiety, problems concentrating, poor memory or be unable to think clearly. A person with severe HE or overt HE (OHE), experiences impaired mental and neuromotor functioning (tremor of the hand when wrist is extended called asterixis) with obvious signs of mental confusion, gross disorientation, drowsiness and coma.

## Treatment of hepatic encephalopathy

There are several treatment options that are currently available in Canada that you can discuss with your healthcare provider.

### Lactulose

Lactulose is an artificial form of sugar that is not absorbed into your body (meaning, it does not enter the blood stream). Lactulose creates a hostile environment for the "bad" bacteria in the intestine, therefore lowering ammonia production in the intestine. It may also be used to treat constipation. Like any medication, lactulose can have side effects, including nausea, gas, abdominal cramps and diarrhea and some people may not be able to tolerate lactulose over a long period of time.

### Antibiotics

Metronidazole and rifaximin are antibiotics that may be used to control the growth of bacteria in the intestine, including bacteria which produce ammonia. Rifaximin is very poorly absorbed into the body which helps it concentrate in the intestines, where it can reduce the growth of unfriendly bacteria.

### Other treatments may include:

- Probiotics or friendly bacteria can change the balance of bacteria in the intestines, increasing the proportion of friendly bacteria. This can result in decreased levels of ammonia production and other toxic substances.

- Branched-chain amino acids (Isoleucine, Leucine and Valine) can help maintain muscle mass and increase ammonia clearance (primarily through the muscle).
- Patients with alcoholic cirrhosis and HE may be given thiamine (Vitamin B1 supplements).

### **Liver transplantation**

The ultimate treatment for HE is to replace the damaged liver with a healthy donor liver. Most of the time patients who receive a liver transplant improve their brain function. However, it is important to control and prevent episodes of OHE as much as possible because numerous episodes of OHE can possibly lead to permanent (and therefore irreversible) brain damage. For this, it is extremely important to take care of your brain during your illness.

### **How do I take care of myself?**

Being confronted with a diagnosis of HE can be overwhelming. HE will affect your quality of life and will impact your whole family. Because HE can affect your memory, concentration and thinking ability, it's best to discuss your illness with your family and whenever possible bring a family member with you to your appointments. Keep in mind that sometimes the changes or symptoms of HE are so minimal that your family or friends might notice them before you do. So it's good to have someone with you who can help fill in the gaps about your symptoms and medical history.

Taking care of your brain during your illness is extremely important. Some of the symptoms of HE, like anxiety, confusion and forgetfulness may interfere with your ability to keep up and follow your treatment regimen, and you may need to ask a family member to help you. You may also need help communicating with your healthcare providers, keeping your medical appointments, getting the necessary lab tests and eating an appropriate diet. One thing you can do to stay as healthy as possible is to eat a nutritious diet. Talk to your healthcare provider about specific diet recommendations based on your needs and response to treatment. Some specific things to keep in mind include the following:

- Maintain a healthy caloric intake
- Eat from all four food groups, including fruits and vegetables, whole grains and cereals, milk products and meats and alternatives.
- Limit your intake of salty, sugary and fatty foods
- Avoid alcohol, sedatives, narcotics and any other medications that are broken down by the liver

A diet high in fiber content is important with an emphasis on whole wheat grains, and fruits and vegetables. This diet will speed up the passage of food through the intestine thereby altering the acidity in the intestines and helping to reduce the absorption of ammonia. Monitoring protein intake is important in order to ensure sufficient nutrition and to avoid malnutrition and loss of lean body mass, all of which can lead to a higher risk of developing HE.



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Exercise plays an important role in maintaining the health of your brain if you have HE. If possible introduce physical activity into your routine. You can enjoy walking, swimming, gardening, stretching and other types of physical activity.

**It is strongly recommended that individuals with cirrhosis who have had episodes of OHE do not drive or operate a motor vehicle, even if they may have “recovered” between episodes. Please discuss this further with your health care provider.**

*Reviewed 2016*