



PROTEIN IN LIVER DISEASE

Protein should not be overlooked when treating patients with liver disease. Meeting increased requirements and preventing protein energy malnutrition is essential. This article looks at the role of protein and dietary advice, particularly in ascites and encephalopathy.

The liver is the largest solid organ and has over 500 functions. Located under the ribs on the righthand side of the body, it sits within the biliary system, including the gallbladder and bile ducts. It is made largely (around 60%) of hepatocytes, otherwise known as liver cells.

These hepatocytes help to absorb nutrients and detoxify harmful substances from the blood. Other functions of the liver include:¹

- processing digested food from the intestine to turn into energy;
- regulating levels of amino acids, fats and glucose in the blood;
- combatting infection;
- neutralising and destroying drugs and toxins;
- manufacturing bile;
- storing iron and other vitamins;
- manufacturing, breaking down and regulating hormones;
- making enzymes and proteins.

DISEASES OF THE LIVER

When our liver becomes damaged, this can affect several of its functions. Damage to the liver may occur due to injury, infections, effects on the biliary system, alcohol intake, or autoimmune conditions. It may affect the hepatocytes directly, or the surrounding biliary system.² Diseases include:¹

- Alcoholic liver disease (ALD)/ hepatitis;
- Non-alcoholic fatty liver disease (NAFLD);
- Autoimmune hepatitis (inflammation caused by the body's immune system attacking the liver);
- Primary sclerosing cholangitis (inflammation/ scarring of the bile ducts);
- Wilson's disease (a build-up of copper in the body);
- Haemochromatosis (iron overload).

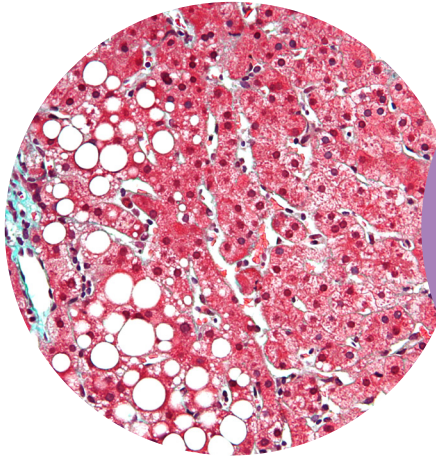
Permanent damage to the liver is classed as liver cirrhosis and may be compensated or decompensated. Compensated liver cirrhosis is where there is irreversible scarring of the liver, but the liver can function as normal and carries no additional symptoms or complications. Decompensated cirrhosis can be classed as end-stage liver disease and carries additional complications. These complications include the following:

- Ascites – the build-up of fluid in the abdomen as a result of fluid not being exchanged within cells as it should do.
- Jaundice – occurs when there is a build-up of bilirubin, a by-product of the breakdown of haemoglobin, which is normally disposed of by the liver. This build-up leads to yellowing of the skin and the whites of the eyes.



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- Hepatic encephalopathy – where a build-up of toxins, usually regulated by the liver, reaches the bloodstream and therefore the brain. This can cause confusion and/or memory loss.
- Portal hypertension – the scarring on the liver increases the pressure in the portal vein (the vein carrying the blood supply from the intestine to the liver), raising its blood pressure. A consequence of this is bleeding varices.

DIET AND LIVER DISEASE

Patients with liver cirrhosis have higher energy and protein requirements. It is suggested that liver disease patients aim for 22-28kcal/kg, plus an activity factor, and 1.2-1.5g/kg/day of protein.⁴ Protein energy malnutrition (PEM) is common in people with ALD – around 80% of patients,³ as often the liver is damaged beyond repair (cirrhotic).

Dietary advice aims to prevent PEM, reduce symptoms of ascites or encephalopathy and ensures the body has a sufficient supply of carbohydrate. Carbohydrate supply is important, as the liver's ability to store glycogen is reduced in decompensated liver disease, meaning that the body looks to get energy from protein stores instead in a process called gluconeogenesis. Carbohydrates are broken down into glucose and stored in the liver as glycogen. Our body uses this as its main energy source and is released in between meals or when fasting overnight to supply the body with

energy. It is, therefore, advised to have a steady source of carbohydrate.⁵⁻⁷

Patients with decompensated liver disease are advised to:^{2,5-7}

- eat small, regular meals, aiming to eat some carbohydrate every two to three hours;
- have a high-calorie, high-protein diet;
- have a snack before bed which contains 50g of carbohydrate;
- follow a no-added salt diet;
- abstain from alcohol.

DIET AND ASCITES

The addition of symptoms in decompensated liver cirrhosis can contribute to the fact PEM rates are high. Ascites (the accumulation of fluid in the abdomen) results in patients having increased protein requirements, early satiety, nausea, vomiting and increased energy requirements.² It is thought that energy and protein requirements are increased due to the body needing to heat the additional fluid to body temperature, or due to increased respiratory exertion of breathing when carrying extra weight.²

A no-added salt diet is also advised for ascites, as excess salt in the diet may worsen the amount of fluid stored. Studies have shown that a no-added salt diet (120mmol/day sodium) is as beneficial as a low sodium diet (40mmol/day sodium), and one small study actually found that patients sticking to a low sodium diet compared to a no-added salt diet, showed energy and protein intakes to be lower.² As a result, patients

Table 1 Examples of foods and the amount of protein they contain

Food	Protein (g)
2 slices beef/lamb/pork	20g
1 small chicken breast	20g
1 small can tuna/salmon	20g
½ pint semi-skimmed milk	10g
2 eggs	12g
½ can baked beans	10g
1 handful nuts/seeds	10g
100g Quorn	14.5g
4 tbsp lentils	4.5g
3 tbsp Greek yoghurt	4g
½ block of tofu	20g
4 ½ tbsp milk powder	6.4g

with ascites should be encouraged to follow a no-added salt diet, by reducing foods high in salt due to processing (eg, tinned products), or obviously salty snacks such as salted nuts and crisps.

DIET AND ENCEPHALOPATHY

Encephalopathy occurs as a result of the liver being unable to play its role in detoxifying the blood, and brain damage occurs. This is not necessarily long term. Encephalopathy can cause patients to become confused – they may forget to eat or think that they have already eaten – and it can suppress their appetite.¹

Dietary advice for hepatic encephalopathy is to ensure patients are meeting their calorie and protein requirements. As a build-up of ammonia may worsen encephalopathy, a regular dose of laxatives to ensure bowels are opening three times a day may also be used in management.

SO, WHAT ABOUT PROTEIN?

Protein is essential for our growth and repair of muscle, as well as playing a role in a number of metabolic reactions. Proteins are large molecules and are made up of chains of amino acids known as the ‘building blocks’ of proteins. There are 20 amino acids, with nine of these being classed as essential, as they can only be obtained from the diet. These nine essential amino acids are:

- Histidine
- Leucine
- Isoleucine
- Valine
- Threonine
- Methionine
- Phenylalanine
- Tryptophan
- Lysine

The terms ‘complete’ and ‘incomplete’ protein sources can be used when describing certain foods, depending on whether they contain all the essential amino acids or not. This can often be when looking at animal protein compared with plant-based proteins, as animal proteins are a complete source of protein as they contain all the essential amino acids. More recently, it has been found that plant-protein sources do in fact include all of the essential amino acids, just in smaller amounts.

The Reference Nutrient Intake (RNI) for protein in adults is 0.8g/kg/day, which is easily met with a healthy balanced diet. Patients with liver disease have higher protein requirements of 1.2-1.5g/kg/day, therefore it is important that high-protein foods are encouraged. These higher protein requirements in patients with liver cirrhosis are due to an increase in protein breakdown and, therefore, turnover. However, despite this, protein resynthesis rate doesn’t increase and the capacity to store proteins is reduced, leading to muscle wastage.⁸

It was once thought that hepatic encephalopathy was caused by dietary protein, with the advice being to restrict dietary protein to reduce the risk of or to manage encephalopathy.⁹ However, more recent research has shown that this is no longer necessary, as protein requirements increase with the development of liver disease.¹⁰

Types of protein have also been considered in the treatment of liver disease and, in particular, hepatic encephalopathy. A small study from 1983 suggested that plant protein may be more beneficial in treating hepatic encephalopathy than animal proteins.¹¹ The reason for this is unclear – potentially due to a high content of branched chain amino acids, or the effect on the gastrointestinal microbiota. However, it is not generally used in practice (unless preferred by the patient, of course), as a higher plant-based protein diet is

generally higher in non-starch polysaccharides, which may lead patients to become fuller and therefore consume less overall energy.²

If a patient suffers from ascites, it is advised that protein requirements are calculated at the top of the range (1.5g/kg/day), due to paracentesis (the draining of the ascites) depleting body proteins¹²

PROTEIN SOURCES

It is recommended that patients with liver cirrhosis aim for three to four portions of protein per day, with portion sizes depending on their individual requirements. Table 1 provides food examples and protein content.

Additional dietary advice for liver disease, such as following a 'no-added salt' diet, should also be considered, and as a result, higher salt food such as cheese or baked beans should be encouraged in smaller amounts.

References

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Due to the nature of liver disease, its complications and dietary advice, it is often easier for patients to adapt a little-and-often approach, which would be suitable when looking at protein sources in the diet as well. Maximising protein in nourishing drinks, for example, is a simple way to increase a patient's protein intake in those with a smaller appetite.

CONCLUSION

Protein should not be overlooked when treating patients with liver disease, as it is essential to help meet increased requirements and prevent protein energy malnutrition. Meeting protein requirements may also improve complications such as ascites and encephalopathy and encouraging a variety of different protein sources regularly throughout the day can help to do so.

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Questions relating to: *Protein in liver disease*

Type your answers below, download and save or print for your records, or print and complete by hand.

Q.1 What are hepatocytes and what is their role?

A

Q.2 Describe four of the main functions of the liver.

A

Q.3 What is the difference between decompensated and compensated liver cirrhosis?

A

Q.4 Describe three complications that can arise with end-stage liver disease.

A

Q.5 Explain the aims of dietary management and why carbohydrate supply is important.

A

Q.6 How does ascites affect a patient and what is the recommended diet to improve symptoms?

A

Q.7 Explain the terms 'complete' and 'incomplete' protein sources.

A

Q.8 Why is it important to encourage high-protein foods for patients with liver disease?

Please type additional notes here . . .